AFRL-RH-AZ-TR-2007-0050

Developing a Taxonomy of Characteristics and Features of Collaboration Tools for Teams in Distributed Environments

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September 2007
Final Report for Aug 2006 to Aug 2007

Air Force Research Laboratory
Human Effectiveness Directorate
Warfighter Readiness Research Division

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REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1. REPORT DATE *(DD-MM-YYYY)*	**2. REPORT TYPE**	**3. DATES COVERED** *(From - To)*
08-09-2007	Final Performance Report	10 Aug 06 to 9 Aug 07

4. TITLE AND SUBTITLE
Developing a Taxonomy of Characteristics and Features of Collaboration Tools for Teams in Distributed Environments

5a. CONTRACT NUMBER
FA8650-06-1-6741

5b. GRANT NUMBER

5c. PROGRAM ELEMENT NUMBER
65502F

6. AUTHOR(S)
Dr. Jinsheng Xu

5d. PROJECT NUMBER

5e. TASK NUMBER

5f. WORK UNIT NUMBER
1123-AS-12

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)

North Carolina Agricultural & Technical State University
Computer Science Department
1601 East Market Street
Greensboro, NC 27411

8. PERFORMING ORGANIZATION REPORT NUMBER

Grant Code No. 210053

9. SPONSORING / MONITORING AGENCY NAME(S) AND ADDRESS(ES)
Air Force Research Laboratory
Human Effectiveness Directorate
Warfighter Training Research Division
6030 South Kent Street
Mesa AZ 85212-6061

10. SPONSOR/MONITOR'S ACRONYM(S)
AFRL; AFRL/HEA

11. SPONSOR/MONITOR'S REPORT NUMBER(S)
AFRL-RH-AZ-TR-2007 - 0050

12. DISTRIBUTION / AVAILABILITY STATEMENT
Approved for public release; distribution is unlimited.

13. SUPPLEMENTARY NOTES
This research was conducted under the Historically Black Colleges and Universities and Minority Institutions program.

14. ABSTRACT

Collaboration refers to all processes where people work together to achieve results. With the advent of computers and the Internet, many collaboration tools have emerged. Synchronous collaboration tools require a team to work at the same time. Asynchronous tools allow a team to work at different times. This final report investigates the available features of these tools, the meanings of these features, identifies common and key features, and develops a taxonomy based on these features. The PI and the team did an extensive market survey of collaboration tools. To gain first hand experience, the PI and team installed and tested nine synchronous collaboration tools and nine asynchronous collaboration tools. This final report consists of three parts: surveying synchronous collaboration tools, surveying asynchronous collaboration tools, and developing a working taxonomy of collaboration tools.

15. SUBJECT TERMS
Collaboration tools, Synchronous collaboration, Asynchronous collaboration, Computer-supported collaborative work, usage experience

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			Oscar Garcia
UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED	UNLIMITED	106	**19b. TELEPHONE NUMBER** *(include area code)* 480-988-6561

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Volume 1

Surveying Features of Synchronous Collaboration Tools

1. Introduction

Collaboration refers to all processes where people work together to achieve results [13]. With the advent of computers and the Internet, many collaboration tools have emerged. Examples of early collaboration tools include E-mail, bulletin board, Internet Relay Chat (IRC), whiteboard and desktop sharing. In a collaborative environment, a team may be spread out in different locations and work at different times. The tools need to facilitate collaboration by making communication among distributed participants as easy and efficient as possible. Synchronous collaboration tools require a team to work at the same time. Examples include instant messaging, application sharing and whiteboard. Asynchronous tools allow team to work at different times. Examples of early tools include E-mail, bulletin board, and web logs.

In this article, we investigate features of synchronous collaboration tools. Synchronous collaboration is also called real-time collaboration, online meeting, or web conferencing. There is an increasing need for powerful synchronous collaboration tools by businesses to get their job done more efficiently and cost effectively. Several studies have shown that the synchronous collaboration tool market has been growing rapidly and is expected to grow continuously for years to come.

Many collaboration tools were developed in recent years. Mayrhofer's survey listed almost one hundred synchronous collaboration tools [16]. These tools provide different sets of features, yet they have common features. Often, the same features are marketed with different terms by the vendors. Questions arise as more and more of these tools emerge. What are the available features? What are the meanings of the features? What are the common features of these tools? What are the key features for synchronous collaboration tools? The goal of this study is to identify common and key features in synchronous collaboration tools. The results of this study will help professionals gain knowledge of what current online meeting market has to offer and aid them to make right decisions in choosing tools based on their meeting needs.

To gain the first-hand experience, we tested nine synchronous collaboration tools: WebEx Meeting Center [1], WebEx MeetMeNow [2], Microsoft Office LiveMeeting 2005 [3], IBM Sametime [4], iLink MeetingLinc [5], Adobe Acrobat Connect [6], Adobe Acrobat Connect Professional [7], Citrix GotoMeeting [8] and Microsoft Meeting Space for Windows Vista [9]. Most of these tools are leaders in online meeting market. We chose Microsoft Meeting Space because it is the only peer-to-peer collaboration tool we tested that does not need server or even the Internet connection. We tested most of these tools as 14-day free trials with the exception of IBM Sametime and Microsoft Meeting Space. We hosted IBM Sametime server on a workstation running Windows 2003 server. Microsoft Meeting Space comes free with Microsoft Windows Vista. In section 2 of this paper, we describe the overview of the running environments of these tools. The results we have collected come from our experiments and the online resources from vendors' websites.

We have recorded many features in our experiments. To organize them, we partition the meeting process into six stages: starting meeting, communication, presentation, interaction, administration, and ending meeting. Except for starting meeting and ending meeting, these stages do not have order and could happen simultaneously. In section 3 of this paper, we explain in

detail the common features in these stages. In section 4, we present a table that summarizes the features of all the tools we have tested.

2. System Overview

Some of the tools we tested run on java-enabled web browsers. Some tools run as a stand-alone application on supported operating systems. Tools that run on web browsers run on more platforms because all popular operating systems have browsers. IBM Sametime installs stand-alone Instant Messaging software but a meeting takes place in a web browser. Microsoft Meeting Space comes with Microsoft Windows Vista, and it requires a wireless connection. Most of the tools have client-server application architecture. Participants are required to logon to the server to start the meeting. Internet connection is required to use these tools. The only exception is Microsoft Meeting Space, which is a peer-to-peer application. In Microsoft Meeting Space, a "face-to-face" meeting tool, a small number of computers nearby use a wireless network in ad-hoc or wireless LAN modes to collaborate synchronously. No Internet connection or server is needed. Most of the vendors host the meeting server for their customers who pay fees for using their service. IBM Sametime, however, does not host the meeting server and users have to host their own server. The maximum number of concurrent meeting participants allowed by these tools varies significantly from 10 to 2,500. While small numbers represent the actual limit of allowed concurrent meeting participants, large numbers are not significant in showing the capability of the tools because they are usually estimations that depend on hardware and bandwidth. Please refer to Table 1 for system overview.

Table 1. System Overview

	System Requirements	Concurrent User Limit	Architecture	Server
WebEX Meeting Center	Web Browser	>1,000	Client-Server	Hosted
WebEx MeetMeNow	Windows	10	Client-Server	Hosted
Microsoft Office Live Meeting	Web Browser	Up to 2,500	Client-Server	Hosted
IBM Sametime	Windows/Linux/Mac Web Browser	>500	Client-Server	Self-Hosted
iLinc MeetingLinc	Windows	>500	Client-Server	Hosted
Adobe Acrobat Connect	Web Browser Windows or Mac for Presenter	15	Client-Server	Hosted
Adobe Acrobat Connect Professional	Web Browser Windows or Mac for Presenter	Up to 2,500	Client-Server	Hosted
Citrix GotoMeeting	Windows/Mac	10	Client-Server	Hosted
Microsoft Meeting Space	Windows Vista Wireless Connection (WLAN or ad hoc)	10	Peer-to-Peer	No Server needed

3. Meeting Stages and Common Features

To organize features, we divide the meeting into six stages: starting meeting, communication, presentation, interaction, administration, and ending meeting. Except for starting meeting and

ending meeting, the rest of the stages do not have order and can happen at the same time. Our goal is to extract common and key features in these tools. Some tools may have more features that are not described below. The same feature implemented by different tools may have different qualities in speed, reliability, and ease of use. Table 2 describes the common features in six stages of online meeting.

Table 2. The common features in six stages of online meeting

Stages	Features
Starting Meeting	Instant Meeting Schedule Meeting
Communication	Text Teleconferencing VoIP/Video
Presentation	Document Presentation Application/Desktop Sharing Annotation
Interaction	Participant Status Polling
Administration	Changing Roles
Ending Meeting	Saving annotated documents Recording meeting

3.1 Starting Meeting

Starting meeting is the stage which is related to how a meeting is created and joined. In a scheduled meeting, the host decides the starting time and duration of the meeting and the participants join the meeting at the scheduled time. Typically, the host will setup the meeting on a web server and email invitations as a URL link to the participants. Participants join later by following the meeting URL. All tools we tested except for Microsoft Meeting Space provide scheduled meetings. In an instant meeting, the meeting host is aware of the availability of participants and creates a meeting by sending instant meeting invitations. There are multiple ways for creating an instant meeting. A typical example of instant meeting is Microsoft Meeting Space. Meeting is created by a host and the participating computers nearby can find and join the meeting instantly. Another way of starting instant meetings is by sending IMs to participants that are online. IBM Sametime begins with an Instant Messaging interface and online buddies can be notified to join an instant meeting. The meeting starts in a web browser that connects to server running IBM Sametime server. Figure 1 shows Windows Meeting Space instant meeting by finding and joining a nearby meeting. Invitation file provides an alternative way of joining a meeting bypassing the searching step. Invitation file is created by the meeting host and distributed to the participants.

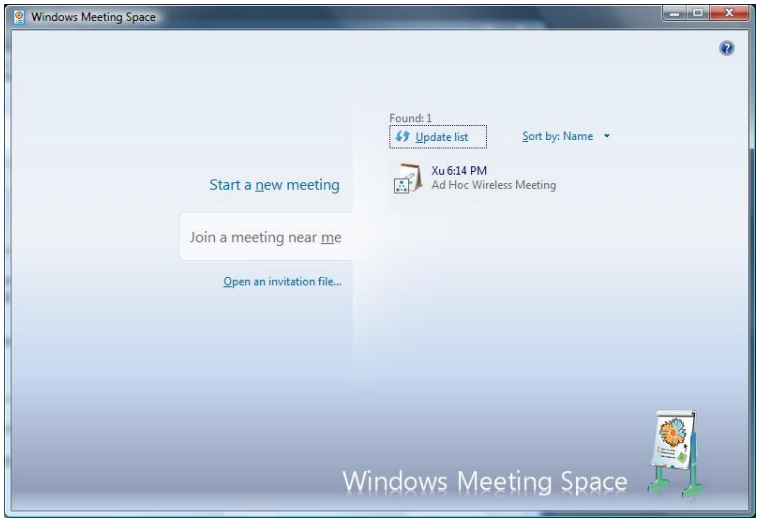

Figure 1. Windows Meeting Space instant meeting by finding and joining a nearby meeting

3.2 Communication

Communication is a feature that allows participants to communicate with one another by text, audio, or video. Some of these tools provide phone numbers for teleconferencing. Among the tools that provide webcam video and VoIP features, the detail can vary in number of webcams displayed at the same time. Since Microsoft Meeting Space is deployed in a physically local "face-to-face" environment where people can see and hear each other, it has none of these features.

In Figure 2, WebEx MeetMeNow shows the instructions on how to join a teleconference. It is common that vendors that provide hosting service also provide phone numbers for users to start teleconferencing.

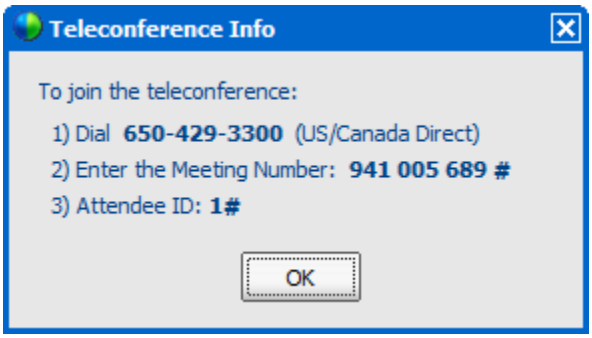

Figure 2. WebEx MeetMeNow's instructions on joining a teleconference

3.3 Presentation

Presentation is the key feature for synchronous collaboration tools. We include document presentation, application sharing, desktop sharing and annotation as presentation features. In document presentation, documents are uploaded by the presenter to the server and distributed to the participants. Microsoft Power Point is the most common document type supported in document presentation. Some tools support documents of all printable file types. These printable documents are usually converted into a non-editable format. That is the reason document presentation is called "share document to view" by Microsoft Office Live Meeting. Adobe

Acrobat Connect Professional also allows presentation of video and audio files. Five out of nine tools we tested support document presentation. WebEx and Adobe leave this feature out of their lower-end products: WebEx MeetMeNow and Adobe Acrobat Connect. Different collaboration tools name the document presentation feature differently. WebEx Meeting Center, Microsoft Office Live Meeting, IBM Sametime, iLinc MeetingLinc, and Adobe Acrobat Connect Professional name this feature as "Document Sharing", "Share Document to View", "Slide Sharing", "Uploading Meeting Agenda", and "Document Sharing" respectively. Annotation is always associated with document presentation. Annotation usually is a simple white-board like drawing tool that allows participants to annotate on the documents. Typical annotation features include highlighter, drawing pen, eraser, pointer, etc. Annotations on documents can be saved for later reviews. Figure 3 shows presentation features of Adobe Acrobat Connect Professional. It has document presentation and application/desktop sharing. Annotation is done by whiteboard drawing tools.

Figure 3. Presentation features of Adobe Acrobat Connect Professional

Document presentation does not allow direct edit to the original document. However, it can be made by application sharing or desktop sharing. Microsoft Office Live Meeting's "Share Document to Edit" is implemented by application sharing. Application or desktop sharing is a very common feature as all the tools we tested have it. The presenter shares its applications to the participants. Participants can be given the control of mouse and keyboard during application sharing and desktop sharing. Some tools allow annotations on application sharing or desktop sharing. However, these annotations are only temporary as they will be deleted from screen as it changes back to application sharing mode. Application and desktop sharing may cause problems because errors in operations by participants may cause loss of data. Because application and desktop sharing require more network bandwidth, the performance is not as good as document presentation.

3.4 Interaction

A very common interaction feature is participant status where a participant can express its condition to the presenter and other participants. The typical conditions include: raise hand, slow down, away, question, etc. Microsoft Office Live Meeting has a seating chart feature that can see

status of participants more clearly. Polling is a powerful way of interacting among the participants. The presenter creates polls using the provided editor and distributes them to the participants. The results of the poll can be made public or private by the presenter. There are five tools we tested that have a polling feature and they are exactly the same set of tools that provide document presentation. Some tools allow participants to initiate questions to the presenter by a Q&A feature. Figure 4 shows nice interaction features of Microsoft Office Live Meeting. It has seating chart, participant status, polling, and Q&A.

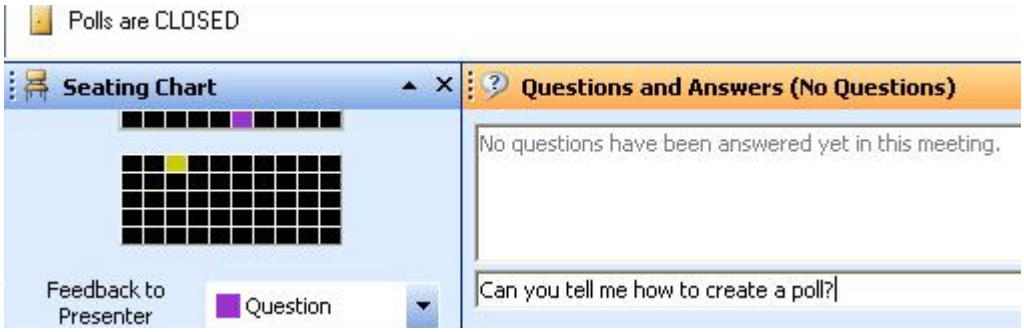

Figure 4. Interaction Features of Microsoft Office Live Meeting

3.5 Administration

Administration features manage and coordinate the meeting. Most of the collaboration tools have three participant roles: host, presenter, and normal participants. The host, also called organizer or leader, is the administrator and coordinator of the meeting. It can remove participants, assign presenter, and set participant privileges. The presenter, also called floor holder, shares its document, application, or desktop. It also annotates and creates polls. The following table shows the roles of participants in six stages of collaboration.

Table 3. The roles of participants in six stages of collaboration

	Start Meeting	Communicate	Present	Interact	Administrate	End Meeting
Host	X	X		X	X	X
Presenter		X	X	X	X	
Other		X		X		

The roles can be switched by the host or the presenter. Host can delegate presenter or transfer role of host to another participant. The presenter can transfer presenting role to another participant. Some tools do not distinguish between presenter and host. This makes the meeting less formal because of the frequent changes of the meeting coordinator. In application sharing and desktop sharing, the control of mouse and keyboard can be switched among the participants. Instead of automatically transferring controls, coordinated request/grant transfer makes meeting more formal and reduces the confusion.

3.6 Ending Meeting

After the meeting is finished, there may be a need to save the meeting for later reviews. There are two common ways of saving the meeting. The first one is saving the annotated documents, result of polls and the transcript of the meeting. All the tools that allow document presentation and polling features have this feature. For example, Microsoft Office Living Meeting saves the annotated documents and polls into PDF files. The other saving method is recording the meeting. Recording usually captures the sharing screen area of the tool and encodes it into a video format. Some tools provide meeting statistics after the meeting is finished.

3.7 Other Features

There are some other less common but interesting features. Microsoft Meeting Space has a "handout" feature that distributes files to the participants and changes are synchronized automatically to all participants. With iLinc MeetingLinc, users are able to create a breakout sessions for smaller group discussion. IBM Sametime has IM features besides its meeting capability. Some tools include IBM Sametime and WebEX have support for mobile devices.

4. Feature Table

The following table is a summary of common features of the tools we tested. Among them, the following five tools have the most comprehensive features: WebEx Meeting Center, Microsoft Office Live Meeting, IBM Sametime, Adobe Acrobat Connect Professional and iLinc MeeingLinc. They have document presentation, polling and saving features that do not exist in the rest of the tools. WebEx MeetMeNow and Adobe Acrobat Connect are "lighter" versions of WebEx Meeting Center and Adobe Acrobat Connect Professional. Microsoft Meeting Space is best used as a file and application sharing tool that supplements a local physical meeting. However, it is the only tool that we tested that works without a server.

Table 4. Synchronous Collaboration Tool Feature Summary

	STARTING MEETING		COMMUNICATION		PRESENTATION			INTERACTION	ADMIN	ENDING MEETING	
	Instant	Scheduled	Teleconf.	VoIP Video	Doc. Presentation	App/ Desktop Sharing	Annotation	Polling	Host & Presenter	Saving	Record
WebEX Meeting Center	*	X	X	X	X	X	X	X	X	X	X
WebEX MeetMeNow		X	X			**	X		X		
Microsoft Office Live Meeting 2005		X	X		X	X	X	X	X	X	X
IBM Sametime	X	X	***	X	X	X	X	X		X	X
iLinc MeetingLinc		X	X	X	X	X	X	X	X	X	X
Adobe Acrobat Connect		X	X	X		X	X		X		
Adobe Acrobat Connect Pro.		X	X	X	X	X	X	X	X	X	X
Citrix GotoMeeting		X	X			X	X		X		X

Microsoft Meeting Space	X					X					

* If WebEx AIM Pro instant messaging is integrated.
** Desktop sharing only
*** Users have to provide its own phone number for teleconferencing.

5. Conclusion

We identified common features based on our experiments and online documentations. We organized the common features of synchronous collaboration tools by six stages of collaboration: starting meeting, communication, presentation, interaction, administration, and ending meeting. Most of the tools have client-server architecture. We would like to see more powerful peer-to-peer synchronous collaboration tools emerge. Current recording feature is still very primitive as it only encodes the sharing area on the screen into a video file. If recording is able to highlight important events and interact when replaying, it would make it a more attractive feature. Although quality of collaboration tools was not our research focus and all the tools tested performed reasonably well, improving the quality of features in terms of ease of use, stability and performance is as important as inventing new features.

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Volume 2

Surveying Features of Asynchronous Collaboration Tools

Introduction

Collaboration refers to all processes where people work together to achieve results [10]. With the advent of computers and the Internet, many collaboration tools have emerged. Examples of early collaboration tools include E-mail, bulletin board, Internet Relay Chat (IRC), whiteboard, and desktop sharing. In a collaborative environment, a team may be spread out in different locations and work at different times. The tools need to facilitate collaboration by making communication among distributed participants as easy and efficient as possible. Synchronous collaboration tools require a team to work at the same time. Examples include instant messaging, application sharing and whiteboard. Asynchronous tools allow team to work at different times. Examples of early tools include email, bulletin board and web logs. In this article, we investigate features of asynchronous collaboration tools, which are also often called groupware.

People have been collaborating asynchronously for many years using email, newsgroups, bulletin board, web logs, and more recently group calendars and Wikis. Many tools have emerged that make collaboration more powerful and convenient. These tools usually integrate existing methods of collaboration and add some new features. Wikipedia has a partial list of collaboration tools [14]. These tools present a wide range of different features. To just list few, the features include email, announcement, instant messaging, chat, discussion board, Wiki, calendar, file sharing, folder synchronization, tasks, time sheet, and Gantt chart. These tools provide different sets of features. Most of the tools use client-server architecture where collaboration related data are stored in a server. There are a few hybrid architecture collaboration tools that use a server for directory service and collaboration data is stored in individual collaborators. Questions arise as more and more of these tools emerge. What are the available features? What are the meanings of the features? How can a collaboration tool help me? What are the common features of these tools? What are the key features? The goal of this study is to identify common and key features in asynchronous collaboration tools. This article will help professionals gain knowledge of what current asynchronous collaboration tools have to offer and help them select the right tools based on their needs.

To gain the first-hand experience, we test the nine asynchronous collaboration tools: WebEx WebOffice [1], Microsoft Office Groove 2007 [2], Zimbra [3], Collanos Workplace [4], ZOHO Project [5], PHProjekt [6], eGroupware [7], Basecamp [8] and Bluetie [9]. We try to cover a wide range of tools with different characteristics. The tools we selected range from client-server to hybrid architecture, from freeware to paid subscription, from email centered collaboration, file sharing to project management. In section 2 of this paper, we describe the overview of the running environments of these tools. The results we have collected come from our experiments and the online resources from vendors' websites.

We organize the features by identifying four function categories of asynchronous collaboration: communication, information sharing, group calendar, and project management. In section 3 of this paper, we explain in detail the common features in these categories. In section 4, we present a table that summarizes the features of all the tools we have tested.

1. System Overview

Most of the tools we tested have client-server architecture with exception of Microsoft Office Groove and Collanos Workplace. In the client-server architecture, collaboration related data are stored on the server. The clients usually log on to the server by java-enabled web browsers. The advantage of client-server architecture is data is considered more secure because it is stored on a well-maintained server. However, there is also a "single point of failure" at the server. The client also needs to have the network connection to the server to be able to access collaboration related data. In a peer-to-peer collaboration, collaboration data are stored in the computers of collaborating users. Therefore, multiple copies of the same documents may exist in these collaborating computers. Synchronization is needed to ensure all the computers have the most up-to-date copy. Because peer-to-peer collaboration tools allow users to update the data offline, the latest version of data may not be able to propagate to other computers immediately, potentially causing data conflict. The problem is usually solved by creating a new copy of the file and notifying the users. Another problem with the peer-to-peer collaboration is synchronization traffic between computers may be blocked by organizational firewalls because the port numbers used are not as well recognized as web protocol. The non client-server collaboration tools we tested are actually a hybrid of client-server and peer-to-peer. In Collanos Workplace, the server provides directory service similar to Instant Messaging tools. Users log on to the server to find if other collaborating users are online and check if there is need for synchronization. The Collanos server does not store the collaboration data. Therefore, although users can edit the data offline, synchronization happens only when multiple users are both logged on to the server at the same time. In Microsoft Office Groove 2007, the server provides a caching service. The update is cached at the Microsoft Office Groove server temporarily and transmitted to the collaborating computers when they become online. The data transmission between users and the server is through web traffic that bypasses most firewalls. When multiple users are online at the same time, the synchronization is carried out directly among the users.

Some of the collaboration tools require users to install their own servers. Free collaboration tools like eGroupware and PHProjekt run on a web server that supports PHP with a database connection. Zimbra's server can be installed on Mac and Linux. The rest of the tool servers are hosted by the tool vendors. The clients are usually web browsers for client-server collaboration tools. Some of the tools provide support for Microsoft Office applications as clients. Collanos Workplace's client is a multi-platform tool. The following table summarizes the system overview of the tools we tested.

	Server	Client	Architecture
Microsoft Office Groove	Hosted	Microsoft Office Groove	Hybrid[a]
Collanos Workplace[c]	Hosted	Windows/Max/Linux	Hybrid[b]
eGroupware	PHP enabled web server	Web Browser	Client-Server
WebEx Web Office	Hosted	Web Browser	Client-Server
Zimbra	Mac/Linux	Web Browser	Client-Server
Zoho Projects	Hosted	Web Browser	Client-Server
Blue Tie	Hosted	Web Browser	Client-Server
Basecamp	Hosted	Web Browser	Client-Server
PHProjekt	PHP and MySQL	Web Browser	Client-Server

	enabled web server		

a. **Server serves as a relay of shared documents. Direct transfer of documents directly between clients is given higher priority.**
b. **Server only for directory service. All document transfers are between clients.**
c. **Use special port number that may not bypass organizational firewall**

2. Features

We found a variety of features in asynchronous collaboration tools. The common features we found include email, calendar, chat, shared documents, polls, wikis, to-dos, Gantt chart, and many more. Some tools implemented many features that are very loosely integrated and independent from one another. Zimbra, on the other hand, is an email centered collaboration that has tight integration with calendar and search functions. To have a clear understanding of what these tools can do for users, we need to organize the features into functional categories. We propose the following four categories for the features: communication, information sharing, group calendar, and project management.

3.1 Communication

The communication features enable users to collaborate by sending messages to one another. The common communication features include email, announcement, chat room and instant messaging. Email is still a very important way of collaborating. The tools with an email feature either host or install POP/IMAP mail servers. The tools that have the email feature also provide contact lists or an address book feature that allows users to store their contacts online. An Announcement is usually a simple web-based feature that enables a user to post time-sensitive information to be shown to the other users. Although asynchronous collaboration tools provide mainly features to collaboration at different times, some of them provide basic but handy synchronous collaboration features including chat room and instant messaging. A synchronous collaboration tool provides more advanced features like application sharing and document presentation.

3.2 Information Sharing

Information sharing features enable users to collaborate by sharing various forms information. The common information sharing features include file sharing, discussion board, and Wiki. File sharing is also often called document sharing. In file sharing, users share their files either by uploading them to the server in client-server collaboration tools or mark them as files that need to be synchronized in peer-to-peer collaboration tools. In client-server file sharing, files are checked in or checked out to update the changes to the files. In peer-to-to peer file sharing, changes are automatically detected and synchronized to other computers. More differences between client-server and peer-to-peer collaboration are stated in the system overview section. Discussion board, also called forum, is another common way of collaboration where ideas are exchanged using discussion threads. Wiki allows users to collaborate on topics by directly editing the contents of a web page. Changes to the contents can be viewed easily using built-in features of Wiki. Other information sharing features include database sharing, address book sharing, bookmark sharing, calendar sharing, and polls.

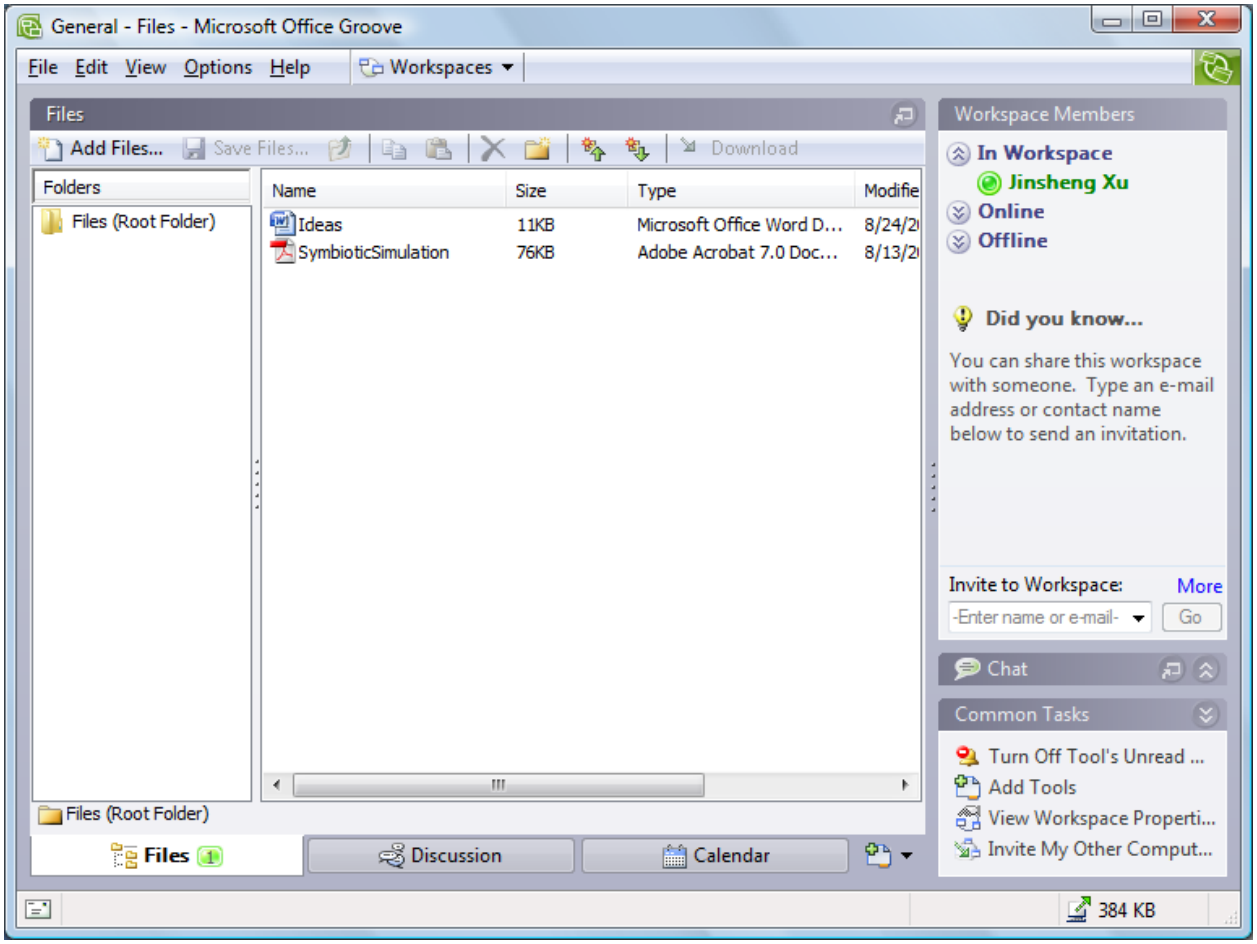

Figure 1. This figure shows file sharing feature of Microsoft Office Groove. It is a hybrid collaboration tool that has other features including a simple calendar, discussion, folder synchronization, and more.

3.3 Group Calendar

Group Calendar is one of the most common collaboration features. Calendar stores upcoming events and the participants of the events. Some tools remind participants when a new appointment is scheduled or upcoming event is imminent. The common method of reminding is by email for web based collaboration tools. With desktop integration the reminder could be a popup message box. Calendar sharing allows users to see others' schedules and make group scheduling decisions. Some tools can automatically detect scheduling conflicts in the users' calendars.

3.4 Project Management

Project management is a complicated process [x]. The tools we tested provide part of the project management requirements. The common features include tasks, milestones, time sheet, and Gantt chart. A Task is also called a to-do. The properties of a task usually have a start date, end date, progress, status, and participants. Users can update the status of a task in a number of percentages completed. Important events in a project can be marked using the milestone feature. A milestone may consist of multiple smaller tasks that achieve the goals of a milestone. Time sheet allows user to record the amount of time they have worked on a project. Some of the tools provide a Gantt chart to represent activities of a project.

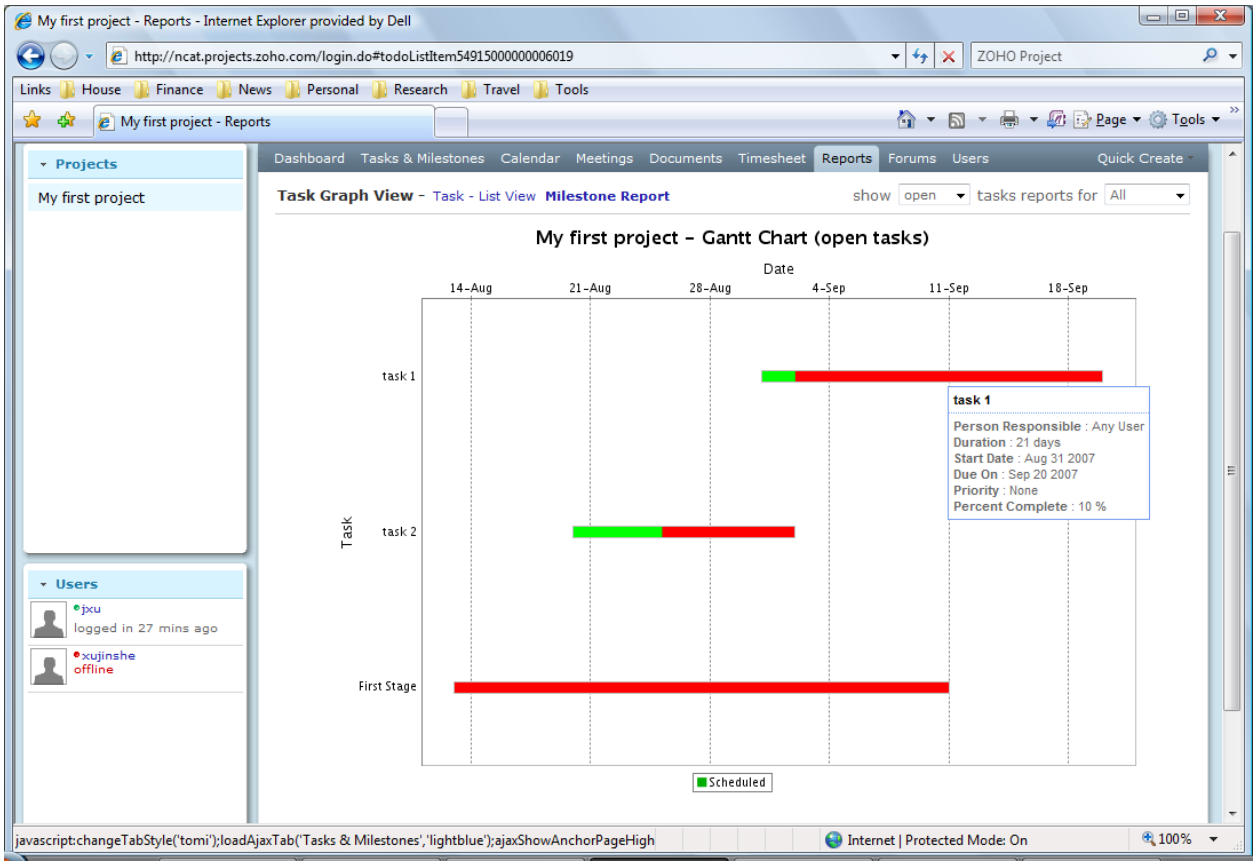

Figure 2. This figure shows Gantt char report feature of ZOHO project. This tool has other features: tasks, milestone, time sheet, calendar and file sharing.

4. Feature Table

The following table describes the features of the nine collaboration tools we tested. Microsoft Office Groove 2007 is a very convenient tool for collaborators to work on the same documents. Compared to web-based file sharing where files have to be checked-in and checked-out, Microsoft Office Groove 2007 provides user-transparent automatic file synchronization. It can also file a folder by “folder synchronization” that makes it possible to automatically share newly created files inside a folder. It provides a simple Instant Messaging interface for users to communicate. Unfortunately, the calendar feature does not provide automatic notification. There is no project management feature for Microsoft Office Groove 2007. Collanos Workplace is free software that is similar to Microsoft Office Groove 2007 in file sharing. However, it is a little less convenient than Microsoft Office Groove 2007 because the shared files have to be put into a specific directory and there is no server caching of changes as described before. It does not provide the important calendar feature. It has a simple task feature in project management, but it lacks other important project management features. Zimbra is an email-centered collaboration tool that has one of the most powerful group calendar features. The web-based email client identifies some keywords such as phone number, date, location, and email address, and lets users conveniently launch different actions by clicking on them. There is a tight integration between email and calendar. It has relatively simple file sharing, and it does not provide project management features. Basecamp, Blue Tie, ZOHO Project, and WebEx WebOffice are

commercial web-based collaboration tools. PHPProjkt and eGroupware are free web-based collaboration tools. Basecamp provides relatively strong project management but it lacks calendar support. ZOHO Project has one of the best project management supports with an easy to use interface. Project management and calendars are tightly integrated. Blue Tie has strong communication features but weak project management features. WebEx WebOffice, PHProjekt, and eGroupware are the most comprehensive collaboration tools as they provide more features than other tools and support more ways of collaboration. However, these features are rather independent and make the software lack a central theme.

	Communication		Electronic Calendar		Information Sharing				Project Management		
	Email	IM/ Chat	Shared Calendar	Automatic Notification	File Sharing	Discussion	Wiki	Polls	Tasks	Time Sheet	Gantt Chart
Microsoft Office Groove		X	X		X	X					
Collanos Workplace		X			X	X			X		
Zimbra	X		X	X	X						
Basecamp		X			X				X	X	
ZOHO Project			X	X	X	X			X	X	X
Blue Tie	X	X	X	X	X				X		
WebEx WebOffice	X		X	X	X	X		X	X		
PHProjekt	X	X	X	X	X	X		X	X	X	X
eGroupware	X		X	X	X		X		X	X	X

5. Conclusion

We identified common features of asynchronous tools based on our experiments and online documentations. We organized the common features by four major functional categories: communication, information sharing, group calendar, and project management. The best collaboration tool is the one that meets user needs. Is my collaboration need to work together on documents with my collaborators? Is my collaboration need to coordinate a project as a team leader? Is my collaboration need to coordinate frequent meetings with my collaborators? It is our hope that this article helps readers in making right choices. Improving the quality of features in terms of ease of use, stability, and performance is very important for collaboration tools. Integrating seemingly independent collaboration features can make new and more powerful ways of collaboration.

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Volume 3

Engendering a Working Taxonomy for Collaborative Software Systems

1. Introduction

A social trend that is currently taking place in the workplace community is the propagation of Communities of Practice, or CoP, in place of the typical bureaucratic hierarchy. Today's information age is founded on the tumultuous ground of change. And in order to make use of such foundations institutions have found it increasingly necessary to process their data in a more fluid and agile manner. (Hildreth, 1999) This change in aesthetics is a major contributor to the move from more traditional Information Systems to Collaborative Software tools. This new ideology brings with it a greater need for asynchronous and synchronous collaboration between individuals. "The art is to help such communities find resources and connections without overwhelming them with organizational meddling." (Wenger, 1998)

The features and capabilities of the collaborative software systems need to be organized and classified. The tools and frameworks for development are available, but also are very much in a state of disarray. Creating a working taxonomy of Collaborative Software features will greatly increase the efficiency of anyone working with or researching these tools. A "working" taxonomy means that the taxonomy should be more than a simple list of software and selling points. This thesis will attempt to go beyond the generation of a table of features with a semblance of hierarchy and endeavor to engender a more organic understanding on which to build a basis for comparison. This is the reason to incorporate aspects of Communities of Practice, because that will add the depth of purpose to this research.

It should now be clear why this subject is not only an intriguing topic but an essential task for the development community. As Collaboration Software matures so must the body of research which governs and prunes its progress.

This research should produce several tangible results, a survey of available Collaboration Software, a research-driven taxonomy of asynchronous and synchronous features, and some conclusions as to how communities of practice and these tools have coalesced over time. The focus of this study is placed on the capabilities and common features of Collaborative Software tools.

The survey of applications will attempt to address a wide range of Collaborative systems from both the open source and commercial fields. The purpose here is to produce an amalgamation of applications so that the sample base includes the most diverse range of software possible. A wide range of software will give a better comparison for the differences and similarities in implementation as well as methodology and characteristics.

A taxonomy of features and their attributes will be compiled from the previous data. Evaluating these features is the primary objective of this research. The data will be stored in a relational database (MS SQL Server) and the structure will be presented using an XML Schema format. Once the features have been enumerated they can be analyzed and classified into a working taxonomy.

The decomposition of these features will be done with special attention to their use within the framework of Communities of Practice. Certain aspects of a CoP, such as reification and especially participation, have particular relevance to the use of Collaborative Software (Communities of Practice [CoP], 2006). Therefore when analyzing the enumerated features the context of their use within the dialectical needs of CoP will be considered.

Overall this thesis is attempting break the ground in an area which has not yet received the attention of the academic community. There is a gap in the body of research concerning this

particular topic which needs to be filled, additionally this thesis will attempt to bridge the distance between knowledge and practical applications under which this stratum of software will be used.

2. Background

There is a growing body of research surrounding Collaborative Software systems and its application in the realms of Groupware and Knowledge Management. The background for this thesis will review a brief history of Collaborative Software Systems and compare some popular features. It will also describe some seminal works which will be used to base the development of the taxonomy.

There is also a great deal of research into Communities of Practice. But it is surprising how these two related fields have developed in parallel without interaction. It is most likely the difference in these fields themselves, Computer Science and Communications, which has caused these two studies to develop separately. It is important to note that although the specifics and approach vary; the overall goal and structure have not significantly diverged.

In fact, they are quite similar. It is also evident that both approaches have had difficulty in defining a stringent set of rules that classifies group interaction in this context. Researchers of Collaborative Software have particularly had troubles developing a useful taxonomy of features. This problem is, in itself, a defining element of the Collaborative Software field. Some tools are designed to address a specific feature, where many are designed to address the entire range of applications for a collaborative system. This also plays into the structure of the organization itself, what requirements it has for Collaborative Software, and the environment in which the software can be used to increase efficiency and benefit Workflow. This is exactly where developments in CoP can benefit the study of Collaborative Software.

CoP is a social structure built around the manner in which people collaborate to share intellectual capital. IBM speaks of its global services experience and how they use CoP in… "Handling explicit knowledge or intellectual capital; handling means gathering, evaluating, structuring, and disseminating knowledge that is shared among community peers and across customer projects and seeing to its evolution. (Gongla, 2001) " This applies directly to the use of software and how it can contribute to the overall process of knowledge management. Using the structure by which organizations capture, codify, and store knowledge will be a good way to evaluate the tools they would like to do this job for them.

For instance, there are many elements that define the type of community in which collaboration is taking place. These very rules will govern the type of collaboration needed to fulfill the goals of the community. Whether they need the capability to edit a document asynchronously and audit the changes made or have colleagues from across the globe share view a presentation or participate in an experiment simultaneously. The methodology for collaboration and many activities performed can be defined within the framework of the community and the type of relationship its members maintain.

Current Status in the Field for Collaborative Systems

One prominent difference between collaborative software systems is whether they are asynchronous or synchronous tools. Being synchronous adds a certain degree of complication to implementation and usually involves some form of serialization of the data for replication

purposes. For a tool to truly be synchronous it must facilitate a means for participants and system components to act in unison. If there are multiple data sources any changes made must be mirrored in such a way that it is transparent to the participants. Asynchronous applications, such as E-mail or a Wiki, do not suffer from these constraints but are more limited on their capability to foster collaboration. A notable comparison between the two would be the difference between an E-mail server and a chat server. Both are viable means of collaboration that can send messages in a multi-media format, but the medium by which the message is sent is considerably different. As are the reasons for using them, there is a task specific choice as to which would be the better tool for the job at hand.

As computer technology has evolved and become more network dependent and internet based; so has the market for software. The evolution from BBS to modern day web applications and content managers like Wiki's is concrete evidence of the web's evolution. An interesting phenomenon is that although the technology keeps evolving new offshoots; the original concept still remains useful. The original BBS system is very familiar to a modern day internet forum. The forum itself is a wonderful collaboration tool for people sharing the same interests. Although for certain situations it is not suited, for instance for an online manual a Wiki's format is much more heuristic.

The pace and scope at which this technology is evolving is a major reason that the body of research dedicated to this field is so rich. In a review of related works, a body of knowledge on which this thesis is based will be provided. The overall framework for Collaborative Software will be reviewed and some seminal work for CoP will be analyzed in order to better view how it can contribute to our goal of classifying features.

History

When reviewing the history of Collaborative Software it is important to note how broad the definition of this genre of software remains. It includes any software used to facilitate collaboration between individuals. This leaves a great deal of room open for interpretation. The ambiguity of the definition and the wide range of applicable tools is a reason for developing the taxonomy for these systems. IEEE spent an entire journal for its Transactions on Professional Communication expounding on E-Collaboration tools. It gives a version of E-mail spun off of ARPANET as "Arguably, one of the first and most successful E-Collaboration tools."(Kock, 2005) The paper goes on to list successive systems, such as the Internet itself.

The Internet is probably the most widely used system in the world today, besides possibly the PBSTN, and it is comprised of a network of servers establishing a means of addressing one another and establishing communication. Originally the Web served up only static pages much like those found in a text book. But recent advances in technology have allowed for a plethora of developments in this field, not the least of which is the ability to serve dynamic content in multiple mediums to web browsers.

It is important to remember that not all applications that take advantage of the internet are web based. Many other open or proprietary protocols have been built on top of the popular TCP/IP or UDP framework for communication. This schism is a defining factor in implementation that is important to consider when comparing software tools. When surveying software this and other facets will be noted.

An emerging trend is the new popularity of devices like the BlackBerry and internet enabled cell phones that can allow TCP/IP communication over the cellular network, or in the

BlackBerry's case via RIM's proprietary SRP protocol. These new CLDC's have lightweight browsers that usually connect to an external server that translates HTML into WML for the phone to display. BlackBerry in particular also allows access to the intranet through their BlackBerry Enterprise Server. And can have custom applications built that communicate on the local network with databases or web servers using HTTP or SOAP for example. This allows "always on" access to email and data from anywhere where RIM's SRP protocol is offered through the Cellular provider. The devices themselves can be managed through an IT policy transmitted wirelessly from the BES to the RIM NOC and then wirelessly to the device. This is a prime example of specific hardware being used to facilitate communication. This would be a detail to be considered when analyzing this service and its placement within the taxonomy.

As noted above the ability to communicate has been significantly advanced over the last decade. Beyond these improvements there are other aspects of Collaborative Systems which have made recent advances as well. There have been several recent advances into how to synchronously access data either in a file or in a database. This has improved the ability to replicate data and to work within the same recordset or file simultaneously. There have also been theoretical improvements such as the advances made in the study of Pair Programming. In a study done by Williams for the University of Utah she describes the benefits of Pair Programming from the prospective of participants, "Pair programmers put a positive form of "pair-pressure" on each other. The programmers admit to working harder and smarter on programs because they do not want to let their partner down. Also, when they meet with their partner they both work very intensively because they are highly motivated to complete the task at hand during the session." (Williams, 2000)

Explorations into the Classification of Collaborative Systems

Interaction generally has a purpose whether it is to foster relationships, change the relationship between two entities, or work together as a group to accomplish a task or instantiate change in an environment. (Abowd, 2002) These three models describe the basic foundations of human interaction.

In Ellis' work describing a framework for Collaborative Systems he delineates four components that define the T-Space, or a technology space in which categories of technology are modeled and the I-Space where interactions between the technologies take place. He categorizes software into four aspects. (Ellis, 1999)

The Keeper of the Artifact, or Keeper, is the aspect of collaboration where an artifact, typically data, is managed and stored. Ellis describes this aspect's purpose, "Typically, an ontological model is associated with a keeper (either explicitly or implicitly.) This model provides a description of the objects and operations that can be applied to the objects. Ideally, this model should include semantics of the objects and operations, along with pragmatics of their intended usage."

Coordinators are described as aspects of collaboration that are responsible for actions that move the group towards their goal. They detail the movement of data or status information regarding a series of steps to reach a desired end. There is a similarity to transactional interactions. Ellis comments on his requirements for Coordinators, "Every coordinator should have an explicit well-defined coordination model associated with it, including concepts of activities, processes, actors, and roles. This is very useful for the initial specification, and the modification, of a process." The first step he describes is something that would be done during

the reification stage for the collaborative process. An example of a Coordinator could be a series of WebPages that allow a helpdesk employee create, track, and modify a trouble ticket.

A major part of collaboration is staying in touch and up to date with team members. Ellis calls these aspects of Collaborative Software systems Communicators. The Communicators purpose is to send and receive messages between participants or system components. Ellis noticed that this aspect gives a stark example of the differences between synchronous and asynchronous systems, "These two examples also illustrate a salient distinction among communicators. Some are real-time or synchronous (e.g. video conferencing) and some are off-line or asynchronous (e.g. e-mail.)" This is an example of how two Collaborative Software systems can share the same T-Space but have completely disparate representations in I-Space. This differentiation could cause some confusion when using this model as a reference for comparison.

Ellis defines one final aspect of Collaborative Software Systems called Team-Agents. This aspect is a scaled down version of a Keeper. Team-Agents don't require the resources or level of access a Keeper would need, it only needs information specific to the task at hand. Ellis further defines this aspect, "Team-agents that are most fitting and successful are frequently social agents in the sense that they are aware of some of the social context, and they interact well with other members of the group." A Team-Agent could be a scheduler that reminds professors of their appointments and determines the best times for meetings. Or it could be a file location device that helps participants find documents correlated to their area of research.

Another similarity in much of the research into this topic is that they tend to break down the taxonomy based on Category's and Characteristics of the software. Ellis bases his set Characteristics on those of previous research into Video Conferencing. His characteristics are Group, Situation, Technology, and Task. (Ellis, 1999) When the Human Factor and Ergonomics Society researched Tools for Supporting Team Collaboration they grouped different tools or devices into common tool categories. Then for each category they showed a table displaying the categories metric for a list of characteristics or type of communication. For example the category listed for Whiteboards can either be Asynchronous or synchronous, provides for moderate interaction and allows for no verbal communication. The list of categories this paper presents is: Face-to-Face, Video Conferencing, Audio Conferencing, Telephone, Networked Radios, Instant Messaging, Whiteboard, File Transfer, Application Sharing, E-mail, Groupware, and Bulletin Boards. (Boldstad, 2003) There are several tools that don't fit neatly into any of these categories. Like the Blackberry, dynamic web applications, asynchronous document sharing, or the Wiki. This taxonomy is great for measuring the characteristics and types of information for each category. But when comparing software that doesn't fit neatly; it can be slightly ambiguous.

The problem now certainly isn't the lack of tools for the job. Most organizations already have email systems, instant messaging, file servers, and more than likely a web application or information system. What they are finding is that even with these collaboration tools, loss of knowledge is an issue due to downsizing or employee turnover. (Wenger, 2004) So the recent growth in collaboration tools has been in the area of Knowledge Management. Microsoft has developed Sharepoint, Lotus Notes has expanded the Domino Server suite, and new technologies like Groove Network's Virtual Office have been developed; all of which cater to the Communities of Practice or Knowledge Management fields. As these ideologies have grown more popular, the trend has been to provide several categories of collaboration tools in one suite. This allows for a more centralized control for administration and better intercommunication between system components. This adaptation allows the Collaboration Software to address a

general set of needs while providing for a more robust system for customization. Even if one package provided all the tools at a knockout price there is till the issue of training employees and getting participant buy-in. The cost of the software itself is by no means the only cost to the organization for deployment.

What researchers have discovered is that no matter how good the software is, if the participants don't become invested in the process the results are poor. Simply put, garbage in equal's garbage out. (Wenger, 2004) The million dollar system is not producing results because the employees aren't contributing due to poor training or heuristics. At IBM there has been a concerted effort into researching how to maintain a body of knowledge for their own organization and for their products. Lesser and Storck explain how they have found CoP to contribute in one of IBM's Research Journals, "Communities [of Practice] also appear to be an effective way for organizations to handle unstructured problems and to share knowledge outside of the traditional structural boundaries. In addition, the community concept is acknowledged to be a means of developing and maintaining long-term organizational memory." (Lesser, 2001)

While researching how Pair Programming improves efficiency another related benefit was discovered. Williams found that collaboration in the form of Pair Programming also reduces the risk of losing social capital due to turnover. "With pair programming, the risk from losing key programmers is reduced, because there are multiple people familiar with each part of the system. If a pair works together consistently, then there are two familiar with this particular area of the program. If the pairs rotate, as discussed above, many people can be familiar with each part. A common informal metric (invented by Jim Coplien of AT&T Bell Labs) is referred to as the "truck number." "How many or few people would have to be hit by a truck (or quit) before the project is incapacitated?" The worst answer is "one." Having knowledge dispersed across the team increases the truck number, and project safety." (Williams, 2000) The concern for future development of Collaborative Software Systems should now be how to best support emerging work environments such as the one discovered here. For instance a development tool that would organize and manage the data and content created by this environment as well as organize and schedule an effective pair schedule and rotation between members would be beneficial to the industry.

In addition to the problem of organizing and disseminating explicit knowledge, there is also the issue of defining and storing the social capital found within tacit knowledge, or knowledge that it not readily codified and must be learned through experience. This is exactly the type of problem that the social science and communications fields have been trying to solve through research and experimentation. For instance, when a new employee joins the group what would be the most effective way to indoctrinate them to the organizations goals and methodologies? How would they learn the knowledge they need to be a productive member of that community? All the handouts, training manuals, and websites in the world can't substitute or deliver much of the tacit knowledge needed by newcomers. An example of the generation and formalization of this tacit knowledge can be found among Message Boards. Over time message boards' participants find themselves bombarded by repetitive questions often from new and inexperienced members. As these questions are answered time and again a more formal approach emerges and will typically be reified into a FAQ or thumb tacked thread that is placed at the top of the message board for quick reference and high visibility to new group members.

Theories for Communities of Practice

To introduce Collaborative Software systems it is important to briefly reflect on how people themselves communicate. One form of communication is rhetoric, a one-to-many format where one person speaks and everyone else listens. Text in a book or a static webpage could also be considered rhetoric. A transaction is another form of one-on-one communication where the communication is where two participants exchange a transaction entity, such as a ticket, order form, or money. Probably the most important form is the conversation, a one-to-one means of conveying information where one person speaks directly to another. This could be in a telephone call or even an IRC or Instant Messenger between two parties. If conversation is the meat, then collaboration is the potato. Collaboration is a many-to-many interaction that takes place when a group of people interact with each other, usually with a common goal in mind. The purpose for these interactions takes a role in defining the manner in which the communication takes place.

Within the social sciences field there are several communities that have been defined to explain the social learning process and relationships that are founded on common experiences or goals; Communities of Action, of Circumstance, of Interest, of Position, and of Purpose. Each community has a particular role in which the participants are bound. Those involved with action are usually not bound by the same constraints as other communities and often are involved in changing the very community in which the participants are acting. An example could be a design group or a chartering committee. Communities of Circumstance are usually made up of members with similar life experiences, such as AIDS patients or Vietnam veterans. They are mainly connected by an event or exigency that gives them the ability to empathize through this experience. Those bound by interest develop a community around one aspect they share and can have little in common beyond this activity. Examples could be communities like Slashdot or the local garden club. Communities bound by personal focus such as age group or religious standing are those of position. Examples would be senior citizens groups, teenage clubs, or Shriners. When communities share purpose it is usually for a given activity and generally spanning the duration of that activity only. Examples of this community can be found in customer support sites or groups for testing beta software.

All the previous groups could be considered to fall under a common umbrella called a Community of Practice, a community where people work together to achieve a common goal. Wikipedia, itself a collaborative community, describes the principles behind CoP, “The concept of a community of practice refers to the process of social learning that occurs when people who have a common interest in some subject or problem collaborate over an extended period to share ideas, find solutions, and build innovations.” (CoP, 2006) The idea is based on research done by Etienne Wenger at the Institute for Research on Learning in order to rethink the social learning that takes place and how knowledge is accumulated by groups of people. His theory has been successfully applied to the Knowledge Management realm and should give a strong theoretical background for creating the taxonomy for Collaborative Software Systems.

A highlight of his theories that has specific relevance to Collaborative Software Systems is the duality of Reification and Participation. Reification is the process by which knowledge is delineated and solidified into formal grammars, structures, workflows, and documents. The opposing yet dependent force would be that of Participation. Participation happens when group members cooperate and engage in activities related to their goals. Notice that both phases are collaborative and essential to one another. Reification without Participation would produce a meaningless erudite doctrine without context or relevance. And Participation without Reification would often lead to disarray or directions of pursuit wholly unrelated to ones goals. The opposing nature gives these two core principles a readily recognizable dialectical tension. But it

is their dependence upon one another that yields a dual quality that is applicable to the overall structure representing how people collaborate.

Hildreth and Kimble further define this by defining the types of knowledge created in both sides of the duality. Hard knowledge is the type that readily lends itself to definition, such as steps in a manual for solving a particular problem. A term Hildreth and Kimble use to describe the process of managing Hard Knowledge is “Capture-Codify-Store”. Soft knowledge is tougher to quantify, it is the knowledge gained through experience and is more difficult to record or pigeon-hole into a specific category. Hildreth and Kimble detail this idea by stating, “Examples of such knowledge might include tacit knowledge that cannot be articulated, internalized experience and automated skills, internalized domain knowledge and cultural knowledge, embedded in practice. Soft knowledge is acquired through the praxis of work and consequently when an organization loses staff, the soft knowledge that is lost cannot easily be replaced.” (Hildreth, 1999)

3. Procedure

After reviewing papers and materials on the topic of Collaborative Software systems and discerning particular needs in this field; an approach to the problem needed to be devised. The chosen methodology was a Bottom-Up approach. The reason for this choice was that it would help generate an aggregation of similar features and in addition it would draw attention to any features that broke the mold or those that were extraordinarily creative. It also provided a means to survey a very large sample of Collaborative Software Systems on which to base the taxonomy.

The first stage of the process was collecting and recording a large number of Software Systems. There were several websites that helped in this process. Wikipedia had a large list of systems that often had a separate page detailing the system as well as links to the developer’s website. Searches of CNET.com and Downloads.com also produced a large number of products. When choosing the products to survey a conscious decision was made to intentionally survey both open source and proprietary software, key players in the industry, and academic software that may lay the groundwork for future development. By choosing a sample with diversity, the chances for an encompassing taxonomy are greatly improved.

From this list of collaborative software systems, enumeration of each feature available to individual applications was performed. Each feature was given a tagline, or synopsis of its purpose. To more fully describe each feature; research into the functionality needed to be effectuated. If the software’s site provided a cogent list of benefits and features; then the given textual description was used. In the absence of the previous, a brief description was added. In this case the description needed to be found in what could be compiled by visual reference of screenshots of the interface, product manuals, performance descriptions and ROI documents, or in lieu of other evidence by basic assumptions against functionality of comparable components already surveyed. For instance if the site simply listed that they provided an Address Book and no screenshots were available, then the manual was checked. Or if nothing else was available, minimum functionality is assumed. Determining minimum requirements for the aggregated features will occur at a higher level in the process. So it is important to note that these descriptions are for the purpose of analysis at those later stages, as well as to provide a substantiated dataset for further research into this topic.

Results of both the previous stages have been stored in a relational database. The chosen database was the MS SQL Server 2005. This format will provide an overall structure that can

scale for future research and also provides access to quick aggregation and queries against the data. A query will be provided that will translate the data into XML format so that it will be available to import into most RDBS. Also, a XML schema can be generated by querying the sysobjects table for a list of columns and their attributes. This will be done so that future research using this data can be pursued without undue concern over the tools used. To report the data the tables were linked into a Microsoft Access Database where queries were attached to the report feature. The data is then exported into Word format to be included in the appendices.

Once the enumeration generating the table of features is complete; the taglines can be used to aggregate the features into similar groups for comparison. This aggregation should also make apparent any deviations from the popular features. During the analysis of this table the categories that have coalesced in the creation of the features table will be described. A hierarchy will be constructed of the different categories and their role within the field Collaborative Software systems will be described. The minimum requirements needed to fall within this category will also be discussed.

This hierarchy will form the basis for the higher level abstraction of principles that will make this taxonomy a working structure. By directly applying theories of CoP to the Upper layer of this model we hope to engender a relevance to the field of Knowledge Management that will make this thesis itself a reification that lends itself to further participation. Simply classifying the elements of Collaborative Software systems is not the goal; this thesis will build its taxonomy within the shared language and ideology of the parallel academic field which gives impetus to the study of the tools being catalogued.

Now that the overall process has been described, the manner in which each step was completed will be covered in detail. As mentioned above there were several sites in which lists of Collaborative Software were available. There were also several sites listed in the proposal of this research considered seminal to the field that were included as well. Given the broadness of the definition of Collaborative Systems it was tantamount to compile a list that held a range of software yet, given the scope of the research, remained a reasonably sized sample. With this requirement in mind, the structure of Wikipedia's listing leant itself to the task at hand. The list they had compiled was organized into two sections, one for open source and one for proprietary software. Getting samples from both of these fields was already a requirement, so having this organized helped cut down on time spent searching for representatives from each group. Being the Shangri-la for information that it is…Wikipedia also readily provided links to and descriptions of a great deal of the key players in the Collaborative Software field. Lotus Notes, Microsoft, Groove, MediaWiki, Slashcode, and many others were all in attendance. Finding academic software posed a slightly more difficult challenge but there was enough of a representation to round out the sample. Over all there were more than 70 separate pieces of software were reviewed. This sample should be abundant and diverse enough to give a good representation of the overall population within the field of Collaborative Software.

One the sample was completed the process of enumeration began. For each individual piece of software a list of features had to be obtained by review or directly off their features and benefits description. As described previously there was a method for obtaining this information that proved reasonably successful. The first search is for a features and benefits page, this page can directly supply the data needed, even if it is not in the format desired. Many of the features and benefits pages were simply tables of features with little or no organization. Another interesting fact is how few of the sites had similar groupings for categories given the similarity of their products. Another problem with this step of research was the number of sites that gave a list

of features with no description or information beyond the three word description. If there was no features and benefits page found, or if the page lacked viable information, then in order to find informative descriptions research was performed on product manuals, screenhots, and ROI documents. Product manuals are denser than the previous search but provide a detailed description of product use from which a list of features can be distilled. By reading the instructions on how to use the product and viewing the tasks it can perform it is relatively easy to determine what features the software provides to the client. Screenshots can also give a good depiction of the product in action, but the details of performance must be inferred from the image. This method worked to fill in the blanks for certain software that had a lack of available documentation. ROI descriptions and whitepapers were another source used to determine features. This source often provided the information needed, although more time was spent removing the sales pitch from the actual functionality than with other approaches. Once the description of each feature was obtained a tagline or very brief synopsis of it functionality was placed with it in the database. These taglines were often obvious and sometimes difficult to provide. They evolved into a set of features from which the hierarchy was be derived. By classifying each piece of software from its description the process of determining strata and subdividing the structure became more intuitive.

In the design process it is often better to use a top down approach, when using modular design it is easier to define the overall structure based on the goal and fill in the blanks with implementation as you go. But when reviewing Collaborative Software systems the overall goal is often ambiguous, especially between separate systems. This necessitated the ability to start from the specifics and build a classification that encompassed the multiple uses of this broad field. Once the taglines were in place and the data thoroughly reviewed, by sorting the data on the tagline it was possible to lump the specific features together into groups. Once the groups were created it was possible to analyze the descriptions to determine the overall purpose for each group of features and from there determine a set of minimum requirements to achieve this purpose. In some cases there were major heuristic and functional differences that required dissolution along the dividing element. For instance, in the category for editing documents it became clear that the differences in asynchronous and synchronous features were definitive enough to require a split along those boundaries in the taxonomy.

4. Feature Aggregation

The aggregation procedure process was essential to the construction of the hierarchy and the formation of a higher level taxonomy. By writing “in 4 words or less what service does this feature provide” the often vague or disparate descriptions become clarified and the generalization process can continue into the classification stages. By using similar taglines; the organization of the aggregated data is enabled because similar features can be grouped together using the same tagline for comparison. This process also singles out any features that do not fall into the typical pattern or that are exclusive to the software package being analyzed. After this part of the procedure has been completed the data has been sorted by taglines giving the original aggregation of features an order based on functionality within the overall collaborative system.

This sorted list was analyzed for the specific roll it plays and purpose it serves within the collaborative system. For each grouping by tagline the details for each feature were reviewed to shed light on where they should fall within a hierarchy. Each leaf on the hierarchical structure represents the output from this step of the procedure. By organizing each group of taglines into

more structured groups which share similar purposes in the collaboration process the bottom tier of our hierarchy is completed. At this stage in the procedure certain distinctions in features were distinguishable.

Distinctive Features

This step of the procedure is the best place to perform a brief review of distinctive features found in the sample of software surveyed because this is the step when the distinctions became the most visibly recognizable. These features display functionality that was found to greatly improve the collaborative process in some way or achieve results in a particularly elegant manner. The list of features to be detailed will be Microsoft's Unified Messaging and ActiveSync technologies, 3D immersive environments like Tuxeo's WorkSpace3D, SubEthaEdits algorithm for synchronous editing, and integration of RSS feeds included in applications like Joyent's Connector or Altassian's Confluence.

Microsoft is a key player in almost any market, but in the realm of collaboration systems they have been fiercely competitive in order to keep the upper hand in the enterprise software market. The outcome of this is the Unified Messaging system in Microsoft's new Exchange server. Exchange is famous for email and calendar sharing by supplying a backend structure to the popular Outlook client. But in order to stay competitive they have stepped up the services provided by Exchange. Unified Messaging stores all types of messages in one system. "The Unified Messaging server role communicates with both the telephone and e-mail components of the organization to accept and route calls, record and play back voice messages, receive faxes, and route messages to subscribers' mailboxes."(Unified Messaging, 2006) What this means is that now each of these components is not only more accessible but many of the features are more robust because they gain all the functionality built in to Exchange for handling email. This improves the efficiency of communication and organization. To drop a cherry on top the Exchange server also incorporates active sync which supplies personal information management services for cellular providers to mobile phones and handheld devices.

One thing Microsoft has not yet implemented is an immersive 3D environment for collaboration. There are very few implementations of this technology, and even fewer commercial ones. Most are academic in nature. Tuxeo provides an immersive environment in their WorkSpace3D that in many ways is familiar to online gaming. Participants can view and manipulate objects in this virtual space synchronously. They are also able to view live streaming video and audio of participants themselves using webcams. This type of immersive conferencing is a relatively new development and the market for this technology will most definitely expand along with its advancements. WorkSpace3D offers more standard features like slide shows, co-browsing, and file sharing along with its 3D environment to allow for a very robust collaboration environment.

As far as advancements goes SubEthaEdit's ability to allow multiple users to synchronously edit text without locking is unique within the industry. Typically programs that allow synchronous editing are plagued with poor usability due to text locking and instability in the communication protocol. SubEthaEdit contains a network communications engine they call the "Million Monkeys Framework" they built around the open standard "Blocks Extensible Exchange Protocol" or BEEP ensure zero-latency, non-locking, constant editing of text. This is an amazing piece of software with a large amount of extra features, but the drawback is that it

only runs on OS X and the provider has no future aspirations to move diversify their distribution to include other operating systems.

RSS in spreading like a brushfire accross the internet and in doing so has earned a spot in several collaboration systems like Joyent's Connector, Altassian's Confluence, and several others. The difference between these two and the other system is the degree to which the feature has been integrated with the collaboration system. They don't just provide RSS clients for outside feeds or simply supply an RSS feed for a specific feature they have both integrated RSS at a level where it can be associated with any project related item. Joyent's Connector enables participants to track all of the information regarding a particular project by using one RSS aggregator associated with that workspace. Confluence provides clients that can read RSS as well as produces RSS feeds as an option for most of its main features. Confluence also provides an API so that RSS can be easily configured into any customization done on the system.

These are just a few of the features available, but this list was compiled from features that were particularly distinctive in the sample made visible during the last step in the procedure. Highlighting these features should help display the capabilities of certain collaborative software systems as well as show possible insight into future development and trends within the field.

Climbing the Tree

To continue with the description of the procedure; the next step in the process involved analysis of leafs from the previous step. The overall goal for the set of features was now generalized from each grouping. And the sets of features fulfilling the same overall function within the system were placed under the new category. Once this was done two new changes to the hierarchy became evident.

The first change needed was for two categories to divide core feature sets that had been generalized in the tag lines but upon further analysis of the detailed descriptions had revealed subsets of features that could be expanded into their own leafs. Infrastructure and implementation features had distinguished themselves from those of organization and the divide here will provide a better conceptualization of the systems represented in the sample. Conversation, Presentation, and Environment were three subcategories developed from analysis of features grouped under conferencing originally. These features had been represented by multiple taglines but had been grouped at this point under one heading. By separating this category it clarifies a specific division of purpose between these three areas. The hierarchy description will go into more detail about each subcategory created.

The second change completed the hierarchy and that was to divide the categories into two main divisions. One group will be placed under Content Management and the rest under Communications. There is a clear divide among which collaborative software systems are currently developed. Content Management systems provide means for people to collaborate using documents, workflows, and shared schedules within a structured workspace. Communications systems provide a means for people to exchange information, provide means of real-time conferencing, or share and interact within a virtual environment. Organizing the tools into these two categories also divides them logically by the type of collaboration taking place. In content management suites participants collaborate using explicit or defined knowledge. And in Communications the knowledge exchanged is often tacit or undefined. By dividing the categories along the lines of the type of knowledge exchanged the hierarchy maintains its structure while incorporating a social context for collaborative systems.

Methods for Linking

The hierarchy created by using the procedure above is useful as a classification system and provides a robust means for defining software features of collaborative software systems. There are several methods that could be used at this point for comparison of features and classifying them using this hierarchy. This is due mostly in part to using a relational structure to store the data.

The Hierarchy is stored in a tree format in the database with each branch in the tree referencing its parent by storing its parents unique ID in a data field. By storing the data in such a way it is possible to link the features stored in the database to leafs on the hierarchy in a number of ways. The most popular will be the typical database relationships of one-to-one, one-to-many, and many-to-many. Each has its viable application in future research into Collaboration Software.

This research will leave a working example of the one-to-many relationship because this is the most relevant example of linking. By linking each feature to any possible category it falls under the dataset will have the ability to query the data using by category, branch, or software title. This greatly increases the value of the data provided and leaves a working example of a popular system of linking for the given taxonomy.

An example of a typical query for this style linking would be to determine “all software features from the presentation category” or “what categories does this software package provide features for”. This type of querying is to be expected for research immediately following the taxonomy and higher level abstraction and will render the model as a functional working example.

It is important to remember that the goal was to provide a more robust system of classification so if needed for future research more tables can be added to provide support for the other linking strategies.

5. Hierarchy

This section has been organized to reflect the bottom-up approach taken to meet these conclusions. The descriptions will first cover the subcategories that were derived from the aggregation of features previously discussed. Once the subcategories, or branches, have been reviewed the limbs or higher levels will then be described. Finally this section will detail how all this relates to the trunk, collaborative systems as a whole, and will begin to frame the higher level abstraction developed from the results of the hierarchy and the communications theories regarding communities of practice. The hierarchy is shown in figure 1, which is included in the text after this chapter.

Infrastructure

The infrastructure is the underlying framework upon which the individual features of a collaborative software system are built. The implementation of this structure defines many aspects such as the operating system, security, auditing capabilities, network structure, data structure etc. These varying features are grouped into this category because they are significant

in their implementation and each provide a backbone or supporting role that is often utilized throughout the rest of the system.

Implementation of these key features determines how well the system will function and how robust it can become. For many organizations these features may need to meet specific requirements and therefore are crucial to choosing a system. In the health industry for instance, finding a system that meets HIPAA compliance standards would narrow the field to a handful or products. Or for large organizations a scalable architecture that can grow to meet enterprise needs would be an important consideration when looking into a collaborative software solution.

For an infrastructure to meet the minimum requirements for a collaborative software system it must provide network connectivity for data communication between two parties or client and server, a structure that supports the storage and retrieval of artifacts. This requirement could be fulfilled by a barebones FTP which would allow participant to collaborate by sharing files. While not robust by any means, it does provide the bare minimum of functionality needed to foster collaboration.

Organization

Possibly the most important category for content management, the organization of artifacts and provisioning of an environment conducive to efficient collaboration is the holy grail for this field. This feature gives structure and systemization to the social capital stored within. Organization allows for orientation and quick location of materials associated with a project or topic. Good organization allows participants to work efficiently and with a concentrated effort. More time is spent accomplishing tasks than finding and assigning resources in a system with good organization.

The manner of implementing organizational control varies. The most popular schema would be an administrative workspace with multiple, possibly nested, projects contained therein. Participants can be assigned to one or more projects and when they access the system they choose a project and are connected to data associated with that project. A portal or dashboard is a typical starting page for this particular style of organization. While effective it still leaves much to be desired. There are several workspaces which provide a 3D virtual environment in which the participants interact. Organization in this environment could reflect a real world office or any another abstraction developers could engender. This format would be the most robust, but is a fairly new technology and would undoubtedly incur more overhead in computational resources and bandwidth.

To provide organization for content management the system must, at a bare minimum, provide some means for assigning content to a topic along with some means of searching and sorting artifacts related to that topic. This could be as simplistic as allowing the naming of files and folders where participants can access data related to their project stored in the designated directory. This format leaves a lot of the organization work to the participants but is still functional for the purposes of organization. More robust organizational tools provide features such as versioning, auditing, meta-data, and heuristic interfaces.

Workspaces

Workspaces provide a virtual office, or at least a virtual file cabinet. They provide the infrastructure and organization utility for content management. The workspace sets the

foundation for how content will be managed, and the other components are layered on top of its model. The two components of a workspace are infrastructure and organization. These two important sets of features divide two necessary components required for a functional workspace. A workspace can be as simple as a form to add, edit, and delete content or as complex as a 3D virtual environment where participants can interact with objects as though they were physically present (very much as in an MMORPG setting.)

A workspace must minimally supply an infrastructure for the content and the ability to manage permissions and content for projects. An infrastructure must support the functionality of the system. The organization must provide a format for the collaboration; it must give a means for the interdependent parts to function as a whole. The workspace should coordinate the other individual applications into a cohesive system.

A participant should be able to manage their account and personal information as well as generate and manage content related to a project to which they have been assigned when using the workspace interface. Providing a functional and heuristic interface for the system that also supports availability of other features is no trivial task and is a major part of the successfulness of a collaborative system.

Scheduling

Time can be a finite and precious commodity. Just ask anyone with a deadline swiftly approaching. Features that comprise the category for scheduling would be calendars and shared calendars, tasks, milestones, and time tracking. The ability to schedule appointments and manage participants' time is crucial to successful collaboration between individuals. This area can make or break a content management system. An added bonus is the ability to send alerts or reminders as well as the ability to view changes in a RSS feed that quickly apprises participants to changes without requiring them to load the whole system. Lotus Notes and Exchange both have a scheduling system that ties directly into email for creating and subscribing to scheduled events.

A minimal requirement for a scheduling system would be the ability to assign items to a calendar and view notification events based on these items. This allows for collaboration by allowing individuals to become alerted to appointments or scheduling issues that have arisen. The sharing and scheduling of events becomes a member of content management because the documentation involving an event will be considered an artifact. Having a set calendar within the system is not dissimilar to having an organizer or a PDA. The thing that sets a collaborative software system apart is the ability for groups to share the same calendar and post changes or new events immediately visible to other team members.

Sharing

The ability to create, delete, retrieve, and share artifacts with other members of the organization is fulfilled by features in this category. This particular categorization is made to highlight the differences between asynchronous and synchronous document editing. In asynchronous editing, the type available to features of this category, the files are edited and then synchronized or uploaded to a central location before participants are able to view or download the artifact. File repositories with web interfaces or FTP Servers are both prime examples of features that fall within this realm. Other more complex examples would be Blogs, Wiki's or image galleries. The difference between this and the editing category would be that the editing

process for asynchronous file sharing is not a collaborative procedure. The collaboration occurs after the fact when the file is shared though one of the specific features.

Features within this category server the purpose of providing access by team members to a locale in which the resources they need to collaborate together as a team are stored. These services generally cater to specifics of the resources which need to be shard as well as the level of access required to the resource. The previous category of organization will also help mold the interface to the repository used for sharing artifacts. A CVS is in many ways quite different from an online image gallery, yet the core functionality of file retrieval and storage are quite similar. These features mainly differ in respect to the type of resource contained within the repository and the type of access needed by the consumers of that resource.

Two particular features straddle the line between synchronous and asynchronous very well. These would be databases and the 2D/3D virtual environment. Although in a strict manner of thinking the documents contained in each are actually asynchronous due to locking mechanisms. They do approach the level of fluidity and responsiveness needed to emulate a real-time environment, and therefore in certain situations could be considered more of a synchronous form of communication. For both of these features it is important to pay attention to these details when choosing a category for any features in this area.

Editing

Artifacts that can be edited synchronously fall under this categorization. This form of cooperative editing is relatively complex to implement, although it is often emulated by responsive databases or web services. The features found that fall under this application were typically text editors. Although there were specific instances like PabloDraw, which allowed synchronous editing of graphics, and Google's Writely, which allowed synchronous editing of spreadsheets in addition to text.

This category has seen a recent surge of growth and is becoming more technically viable. The software SubEthaEdit makes a claim that there algorithm has made recent advances that allow the editing of text synchronously without locking lines or sections of the text during manipulation. This would be an advancement that should expand the usefulness and usability of tools in this field. In fact, if there were a reward for best-in-show for this category this tool would take home the prize. It is particularly advance for this niche. There is a downside to picking a niche utility though, and that would be interoperability. This tool is great for its purpose, but it doesn't necessarily play well with others.

That being said, this category is the area where there is the most potential for growth. Look out for more tools on the market that approach the threshold for synchronous communication artifact manipulation. It is also important to note that this category of tools is often paired with communication technology. This gives the participants the ability to communicate while editing the document. Every tool in the sample that provided synchronous capabilities to edit artifacts also included Instant Messaging if not Audio/Video conferencing features as well.

Documents

This category deals with document files, images, tuples, code, etc. To generalize all these forms of storing information, they will be referred to interchangeably as artifacts or

documents. Information that is stored within these documents could be referred to as explicit knowledge, which is knowledge that is readily identifiable and can be easily documented or recorded. This can be files or data or even a recording made of a conference to be used for auditing purposes or review.

When considering social capital the artifacts a company has created often are worth a great deal. The ability to collaborate while sharing documentation is a vast improvement that is beneficial to participants who do not work in the same location.

Lists

An important distinction between document storage and lists is apparent in a database table, Tuples could be considered to be individual documents containing information and the table itself is a list of tuples. Having documents or lists stored in this format improves organization and the ability to sort along the lines of meta-data. The use of RSS feeds has also enabled these lists to be updated without having to download the entire list, by subscribing to the feed participants are able to receive the changes or additions instead of having to load the entire set.

Many popular features are deployed as lists of artifacts, Address Books, Bookmarks, Notes, and often data is displayed in this format as well. Another important note is that lists, although useful for collaborative purposes, do not necessarily imply that communication is taking place. A messaging system is often in a list format, but the given context of purposeful and direct communication separates it from this category.

Another distinction, along parallel line of thinking, is that these lists of artifacts contain explicit and codified knowledge where in general a line of communication, even when depicted in a list format, is not so formal in its discourse. Context plays a major role in the functionality of tools in this field and has been given consideration in the formulation of the taxonomy.

Repositories

Dr. Codd would be proud. The current field has a plethora of data repositories and available relational database systems. The collaborative software field has even cleaned up the process of archival and retrieval necessary for storing a cornucopia of file formats. Lists have also become a standard tool for organizing and sorting data. Keeping data uncluttered and accessible has been a sought after goal that now has a variety of elegant solutions that address a wide array of needs. There are image galleries, databases with advanced analysis and data mining techniques built in, file storage with web access, and robust permission systems for complex organizational requirements. There is also a seemingly limitless amount of tools to massage, shovel, report, or aggregate data. And the amount of meta-data, user-awareness, and versioning features available to repositories make this one of the most robust categories in the collaborative software field.

Workflow

An easy way to conceptualize workflows is to picture a form full structured to contain all the data useful and necessary to completing a specific task. Then visualize that form in action guiding the participant through the documented process and correcting mistakes or proffering

suggestions. Another use of this term refers to tracking the process of work through an office or virtual workspace. For instance workflow for a typical manufacturer would be from customers order in AR, to the order fulfillment. And in the case where the materials requested are not on hand AP would make a purchase order which then would be fulfilled and entered into inventory. The materials would then be added to the bins where requisitioning would use the materials in a kit to form the final product, ship, and then invoice the customer. Upon payment the general ledger would be updated and the bean counters could satisfactorily rub their moustaches and take an early lunch.

The purpose of that rhetoric was to instantiate the precept that a workflow has a great deal of worth in the area of social capital and when correctly engineered and pruned can improve performance and efficiency of collaboration exponentially. The creation and participation in workflows and, their improvement, should be a goal for the use of collaborative software systems.

Content Management

Collaborative software systems have two major categories, Content Management and Communications software. Systems that focus on content management have a deeper concern with organization of projects and the artifacts that are created within an organization. From the background research this type of social capital can be discerned to be explicit knowledge as opposed to the tacit knowledge of individuals shared through experiences and divulged through communications. The artifacts in question can be a wide range of things, raw data in a database, the year's calendar with appointments and milestones, files or spreadsheets, the general ledger, and so on.

Major subcategories for a content management system are workspaces, scheduling, repositories, and workflows. These have already been discussed in detail individually. But it is important to cover how they were grouped into this category. Everything in this category deals with the creation, organization, distribution, or practice or maintaining tacit knowledge or artifacts. For each subcategory it is important to notice that the manner of work is asynchronous, excepting only a few (and one would be co-editing of content or participation in a workflow which is generally also paired with a means of communication from the other group), and this comprises tools that enable collaboration where synchronous or real-time communication is not necessary.

Minimum requirements for this area would be the ability to organize artifacts in such a way that they are accessible to members of a team and inaccessible to non-approved entities. In addition to that members of the team must be able to create, edit, and remove artifacts from the system. A general approach to a barebones system would have a means to create a workspace with one or more projects, each project with its own set of team members, schedules, artifacts, and procedures.

Messaging

If there is one area that has no problems with representation in the field it is this category. The ability to participate in correspondence via the internet was one of the first features that could be considered a collaborative software system. BBS and later more robust Message Boards are also popular. Then came the dawn of Instant Messaging and the world was changed for

teenagers everywhere, although this tool is much more useful than may first meet the eye. It provides synchronous communication abilities and often integrates multimedia and file transfer. More recently RSS has taken the stage and has found popularity among news and podcast aficionados. Both of the previous are also useful tools for collaboration that fall into the messaging category.

Messaging differs from conferencing in that the purpose of a message is to convey information from source to a group or individual. A conference usually infers that participants can interact synchronously and as a group, whereas messaging is mostly asynchronous and between two individuals. Two exceptions of note are mailing list-serves and instant messaging. List-serves fall under this category because they are still a form of asynchronous communication with no participation between disparate participants. Instant messaging is a more complicated topic. It is the one on one nature of the communication and back and forth (compare it to a tennis match or to a telegraph vs. a telephone) nature of the medium that relegated this feature to the message category. Although when used in a chat room instant messaging crosses the boundary into what could be considered conferencing.

Conversation

The ability for two or more participants to synchronously exchange information as if they were having a face to face conversation is represented in this category. Audio and video conferencing provide a venue where participants can collaborate as if they were sharing the same room, even though they could be continents apart. Being able to read nonverbal communication and cues and hear tone of voice enriches the ability for participants to fully interact with one another. This experience can help build a stronger community and can improve quality of relationships between participants through community building.

Instant Messaging and SMS also have the ability to synchronously communicate and can in some senses be considered as belonging to this classification. SMS is mostly included on devices such as cell phones or cellular network enabled PDAs and this gives the communication an “always on” quality that not found in most IM utilities. Although most IM clients have the ability to create/join chat rooms which is a feature that SMS does not incorporate. Both allow multimedia messages. Another factor that comes in to play is hardware. An example of this would be the BlackBerry devices which provide a number of messaging and conferencing features such as email, SMS, PIN, and phone. They also allow a connection through to the company’s intranet through the BlackBerry Enterprise Server that allows access to WML compatible web pages, web services, and data.

Presentation

There are many features of conferencing that do not enable communication between participants, but instead allow for the synchronous sharing of multimedia or artifacts. Examples of this are Co-Browsing, Content sharing, or the whiteboard. This set of features places the tools to available in a regular conference room into a virtual setting. Presenters can use these mediums to highlight points or to demonstrate using slides or textual backdrops. One of the most impressive features in this category was Baranga Meeting’s ability to pass the control of the presentation between parties, effectively changing hands and making a smooth transition between expositors. This same piece of software introduced the hand raising feature that could

also be considered part of this category, but given its nature should also be considered a method of giving feedback. The benefit of hand raising in this category would be that a presenter could carry on with the presentation while a second presenter answers questions and posts answers into a the presentation interface where all participants can review them without breaking the flow of the actual demonstration. This utility is unique in the fact that it goes beyond providing a virtual setting that mimics or emulates a real life environment and actually improves upon the act of communication taking place.

By enabling participant's ability to share artifacts and content during a presentation this feature set has in combination with messaging provided a virtual domain in which collaboration can take place. Yet, the environment is still abstracted to a set of tools that can function in unison and does not quite provide a cohesive environment for participants.

Environment

Features in this category try to address the lack of a cohesive environment found when using the two previous categories, even in parallel. This is most useful when participants need to interact with the data and would like to share resources. Desktop, application, and region sharing are popular implementations designed to meet this particular need. They allow participants to pass or share control of local resources. Help desk and product demonstrators find these tools very useful when solving problems on a remote desktop or demonstrating a local piece of software to a remote client.

Other more recent advancements have created a virtual 2D/3D environment in which participants can interact. They model FPS or MMORPG style games in which the participants are immersed into the environment and can interact with one another as if they were sharing an office. This unique feature is currently being developed and should reach its full potential as the technology matures.

Conferencing

This category embodies features that allow synchronous communication between groups of people. There are a variety of ways to achieve this goal and several specific applications that warranted several subcategories. This particular area of communications is growing in industry and the home markets. With the growing popularity of VoIP, through Smart Phones and companies like Skype, the landscape of the communications industry is changing. For now there is a schism between content management systems and communications technology. Few of the software reviewed offered a full package that included both branches of this tree. As the communications industry matures these two technologies will blend and there will be a more homogenous market for these tools. Conferencing and presentation features will not only be included in the more popular software suites, it will become integrated in the same manner as email and calendars.

Feedback

Feedback is a useful feature that is often overlooked. This is category of software includes features that enable participants to express emotional content, simulate non-verbal communication, quiz, or vote on a topic. An example form the features would be user location

and awareness. The ability to view who is logged in and what they are doing greatly improves the effectiveness of communication. The use of emoticons allows users to express a simple form of nonverbal communication when communicating in a medium where visual cues cannot be read. In 2D/3D virtual settings is it also possible to emulate body language by sending cues to the virtual representation of the participants. As the sophistication of this technology grows so will the complexity of visual cues offered. Software with GPS enabled can also give feedback about the location of participants. This can be incredibly useful to the shipping industry, but could have a much wider range of applicability.

Quizzing, and polling or voting also enriches the collaborative environment by allowing for an assessment of knowledge or a structured feedback to a given topic. This form of feedback is more formal then the other methods, but also provides a system of metrics for measuring participant's reactions and opinions.

Communications

The ability for team members to communicate is essential to a collaborative environment. Even for a system where the focus is primarily on content management team members will minimally require some means of relaying messages to one another. The means of communication vary greatly. Very early in the history of the internet a means of exchanging messages dubbed E-mail was invented. Most recently there have been advances in communication technology that allow for streaming audio and video making it possible for multiple parties to share live communications in real time. In other environments users can interact with one another in a virtual environment much like the ones created in Massive Multiplayer Online (MMO) games. Oddly enough, in one of the most popular versions of these games, role playing games or MMORPGs), characters often share resources and accomplish objectives as a team. It should be apparent how this could easily translate to a work environment, although there is no guarantee that it won't lose some of its appeal.

Minimum requirements for a communications system would simply be the ability to reliably relay messages from one party to another. And vice-versa. That being said, it is never quite as simple as it seems. Take E-mail for example, a reliable message system used the world over yet it is still plagued with synchronization issues and with spamming. VoIP technology itself has issues with security and with latency on lower bandwidth networks. This ideology is simple in its fundamental purpose but complex in its implementation.

Another factor for consideration is that one version of communication is not the best means of communication for every context. A variety of communication mediums is preferable for an efficient work environment. Often times a simple email will suffice, is cheaper in bandwidth cost, and avoids being bogged down by time spent conversing and engaging in dialogue. For instance on the way out the door it is preferable to drop a line through email than set up a VoIP call with a colleague. Yet often E-mail does not suffice for conveying the context of a message and the ability to speak directly with the other party greatly improves the speed of achieving the desired result. There is no downtime between the correspondences and participants can judge reactions of colleagues by tone of voice or nonverbal communication. In some instances being able to share environments or display slides for a presentation are convenient.

Context is a very important aspect of the communication category and plays an important role in the overall taxonomy for collaborative software systems as well. The higher level abstract

will clarify the different contexts found in the collaborative process and relate them to the categories used to classify the tools of the trade.

Collaborative Software Systems

The highest level of the taxonomy encompasses all the myriad features heretofore covered and classified. In the broadest sense collaborative software systems can range from something a simplistic as a FTP Server to something as robust as the Lotus Notes suite. These systems can be based on specific hardware like the BlackBerry handhelds or AnyZing keyboard multiplexer. They can also fill a specific niche like the SubEthaEdit or create a framework for a protocol such as WebDAV does for authoring and versioning. Using the hierarchy will help classify the features of these software packages but an organization that has begun to research this area also needs to put into perspective the specific needs of their learning community when developing a plan for implementing the deployment for a collaborative software system within their existing infrastructure. This thesis has developed a higher level abstraction of the components used within a collaborative software system using theories from communications studies. The specific theories chosen are related to the research into CoP and how they play a central role in organizational development.

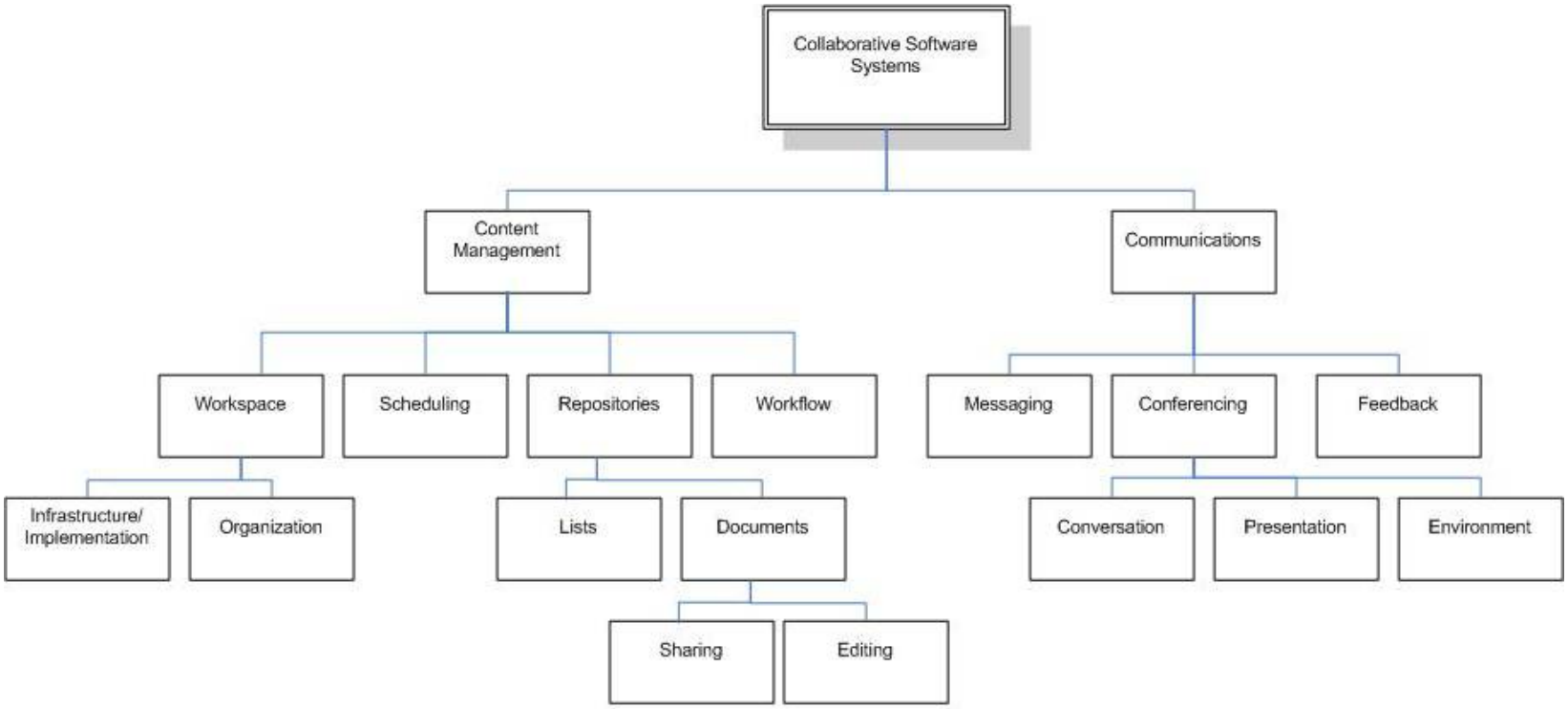

Figure 1. Hierarchy for Collaborative Software Systems

6. Higher Level Abstraction

The higher level abstraction of the overall process used in the management of social capital embodies theories from communications and the systems development life cycle. The major proponents for CoP have developed theories regarding how communities are important to the substantiation and longevity of knowledge within organizational environments. By taking the dualities they have shown to be staple compositions of the overall process of knowledge management and using the development lifecycle to give them a framework within which to operate should engender a working taxonomy. Higher level abstractions help define “how you know what you know” and where it finds its place in the larger picture. Please refer to figure 2, included after this chapter.

Two of the core dualities delineated by the theories of CoP are those between knowledge creation and knowledge management, and participation and reification. The two dualities are very similar in concept yet focus on different aspects of the collaborative process. In each duality the contraposition of the two boundaries creates a dialectical tension. Yet the two terms must coexist or the other becomes purposeless. Without managing knowledge that has been created the creation process looses meaning, and the diametric argument is without the creation of knowledge there is nothing to manage. The same tension and codependence in the relationship was previously described for participation and reification.

So, what does all this mean? After defining the dualities it is important to give them a context related to the field in which they will be applied. For most organizations the product or systems development lifecycle is the way in which the creation and maintenance of their product is measured. In the instance of social capital the product itself is knowledge. By using the systems development life cycle to give context to the two dualities it creates a road map of sorts for the overall process. And it makes it easier to find where the features of collaborative software systems could be useful at what stages different features should be considered.

Each stage of the lifecycle corresponds to one of the sides of the dualities and has a specific type of action that generally occurs during that stage. There is also a guideline for transitions from one stage to the next. The transitions will naturally occur following clockwise movement on the life cycle, but it is important to note the similarities of the diagonal sides of the two dualities, knowledge management and reification as well as knowledge creation and participation. Recognizing how they sometimes cross boundaries in that manner will further detail how the features can be used.

The stage where the process “begins” will be considered to be the knowledge creation phase. This is the stage where the main action will be communication between participants. One can expect that explicit knowledge or such as documents or results of data analysis stored previously in the knowledge management phase will be accessed or reviewed. Features particularly useful during this stage would be many forms of conferencing, feedback, and specifically quizzing, polling or brainstorming utilities. During this phase tacit knowledge is created and shared. War stories and personal experiences are compared and relationships are built. Another essential aspect of this stage is what is taken with the participants after the stage is completed and knowledge has been created. The ideas, processes and topics discussed must make a transition into the reification process to remain useful to the organization.

The reification stage solidifies knowledge created previously into more formal and explicit formats such as documents or workflows that the organization can then draw from at later stages. Concepts explored in the previous stage can now be laid out so that efficiency is

improved and any social capital generated can be codified for storage. During this stage vocabulary is often created and participants begin to form a shared language and system of thinking that reflects concepts key to their community. Features useful to this stage are those that enable the creation of workflows, documentation, and data entry. The recent introduction of synchronous features for editing artifacts helps combine this stage with that of knowledge creation and streamlines the process of reification by improving the efficiency of transferring a tacit idea to one that is explicitly delineated. Recording plays a major part for the documentation stage, notice that the diagonal here is included because knowledge that is included must be stored. So features of knowledge management will be utilized. Note that the overall cycle of how social capital is managed needs to proceed through the participation stage. The actual capital at this point, even though stored in the knowledge management system, can be considered a raw product that needs to be refined by the participation stage to achieve to its true worth to the organization.

To complete the transition the concepts codified in the previous example must be applicable to the actual working environment in which participants collaborate. Participation in this stage consists of using the social capital in the collaboration process where the actual work is done. The ideas generated, once solidified, must now be put into practice. This is where sellers sell, designers design, and computer scientists think of how much easier this would be if we could get a computer to do it for us. The artifacts and workflows created in the reification stage are put to the test and a lot of data related to the organizational processes is generated. Features commonly used during participation stages are messaging, workflow, and database. Blogs and Wiki's can also be used to create content or describe personal experiences or incidents discovered in the participation stage of the cycle. An aside on the diagonal relationship between practice and communication is that tacit knowledge is often created in this stage as well. And it is often necessary to communicate on the fly with colleagues to create solutions to problems or resolve issues that crop up. Although it is possible to move on the diagonal here it is crucial for the health of an organizations social capital to participate in the knowledge management phase of the life cycle. If knowledge is always created on the fly and solutions remain undocumented then an organization will often find itself in the position where it is wasting time reinventing the wheel or wasting time pursuing paths that upon further review would have been evaluated as fruitless pursuits.

The large amount of data and recordings of experiences generated by the last stage must make the transition into the knowledge management system of an organization to be stored for future analysis and review. This is where repositories become very helpful, specific features would be file storage systems or databases. The data stored here should be available to those associated with the projects in which it could be useful. The type of knowledge management system an organization uses plays a large role in the ability to receive returns from social capital created in the previous stages. Although, given the nature of the duality, even with a perfect knowledge management system, if the previous stages are not nurtured their will be a lack of value in the social capital that is stored. The cycle is completed when data or documentation stored in the knowledge management database are analyzed, researched, or reviewed and a group of participants meet to discuss future plans of action based on the findings.

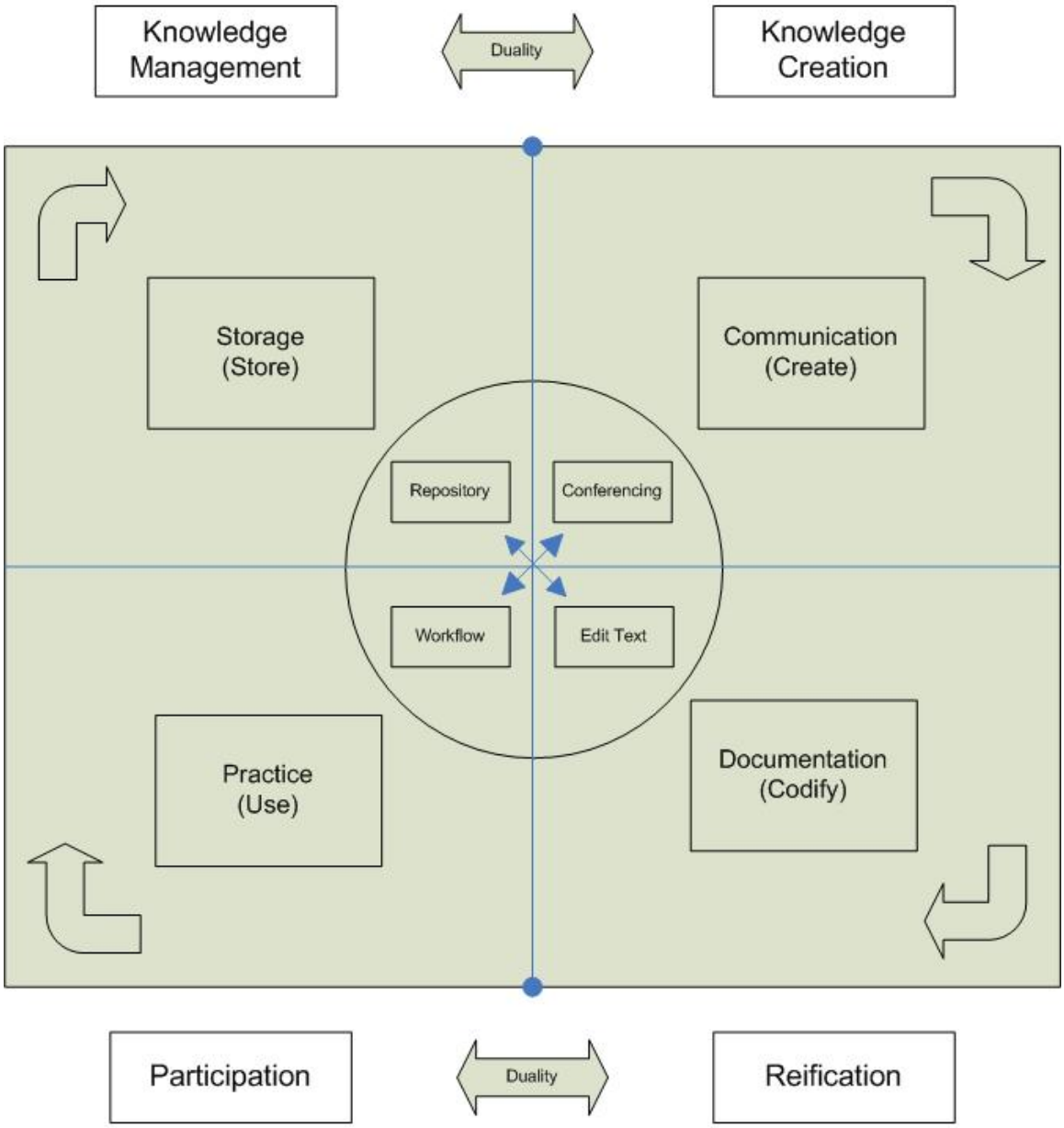

Figure 2. Higher Level Abstraction

7. Conclusion

By following this life cycle and using it in tandem with the hierarchical structure a more robust system of classification is presented. The map for features and their placement within collaborative software systems has been given context as well as structure. By incorporating communications theories involving CoP this thesis has used the shared language and methodology of the field in which its collaborative tools are typically applied. By using a bottom-up approach a large sample of software and software features have been classified and

provide an example of the taxonomy in use. The structure of the data and taxonomy have been stored in a relational database that enables future work to add to the data and structure without having to completely rework the data structure.

The taxonomy of collaborative software features meets the needs of categorization and generalization needed in this field by providing a system for not only placing features within the hierarchy but by allowing organizations to review the process of collaboration and place the features within this context. This work will also make contributions to future research by providing a system of classification that enables the determination of more specific questions regarding development or deployment of specific collaborative software solutions. Examples of future research that could benefit from this taxonomy are heuristics and HCI development, human resources and training facilitation, product development and functional design, as well as those investigating deployment and systems integration.

Future Work

Collaborative Systems is a rapidly growing field with a broad range of applications and the potential for specialization in many areas. As the proliferation of newer technologies like VoIP or RSS continues they will be integrated into the more mainstream applications. The globe is becoming a smaller and smaller place with the inability to communicate or share information becoming less of an issue; the focus will shift to the quality of data and the establishment of effective communities of practice.

Another parallel field to collaborative software systems is knowledge management and more specifically predictive analysis, or data mining. These predictive tools will eventually be incorporated with collaborative systems. Instead of simply sharing tools participants will have built in features for analyzing meta-data or finding trends. The ability to securely access data from your intranet from connected devices will allow greater access to information needed. This will improve efficiency and reduce downtime for a growingly decentralized office environment.

The potential for tools that allow synchronous editing to change the way in which people collaborate is not just a pipe dream anymore. Tools on the market provide this feature without locking text and causing inconvenience during use. This changes this particular collaborative effort into a more fluid and cohesive environment.

Researching how to get community buy-in and development of better training programs is one area that will need improvement. Organizations need to reevaluate the way in which they operate to get a larger return on their investment into knowledge management and collaborative software. A great motivator for investing in collaborative software is its ability to mitigate the loss of knowledge experienced as a result of employee turnover. The ability to access artifacts and workflow in an environment that reflects the nature of the work is invaluable to a new employee. The ability to communicate, via messaging or conferencing, allows new employees to quickly build relationships with more experienced coworkers. These areas of growth will necessitate further research into collaborative software and its features.

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APPENDIX A

LIST OF SOFTWARE

Software Name: 24SevenOffice **Company:** 24SevenOffice
URL: http://www.24sevenoffice.com/webpage/int/

Software Name: Access Grid **Company:** Argonne National Lab
URL: http://www.accessgrid.org/

Software Name: ACE **Company:** ACE Project Team
URL: http://ace.iserver.ch/

Software Name: Alfresco **Company:** Alfresco Software, Inc.
URL: http://www.alfresco.com/

Software Name: AnyZing **Company:** Zing
URL: http://www.anyzing.com/businesstitles.html

Software Name: Balinga Meeting **Company:** Batipi
URL: http://www.batipi.com/phpcode/web/services.php?id=185

Software Name: Baloka Meeting Room **Company:** Batipi
URL: http://www.batipi.com/phpcode/web/services.php?id=197

Software Name: Baranga Meeting Room **Company:** Batipi
URL: http://www.batipi.com/phpcode/web/services.php?id=194

Software Name: BaseCamp **Company:** 37signals
URL: http://www.basecamphq.com/

Software Name: Basic Support for **Company:** Fraunhofer Society
URL: http://bscw.fit.fraunhofer.de/

Software Name: BlackBerry Enterprise **Company:** Research in Motion
URL: http://www.blackberry.com/products/blackberry/index.shtml

Software Name: Bricolage **Company:** Bricolage
URL: http://www.bricolage.cc/

Software Name: Citadel **Company:** Citadel
URL: http://www.citadel.org/

Software Name: CollabNet **Company:** CollabNet
URL: http://www.collab.net/products/enterprise_edition/

Software Name: Collanos Workplace **Company:** Collanos Software
URL: http://www.collanos.com/m1/en/

Software Name: CommunityZero **Company:** Ramius Corporation
URL: http://www.ramius.net/solutions.cfm

Software Name: Confluence **Company:** Altassian
URL: http://www.atlassian.com/software/confluence/

Software Name: Connector **Company:** Joyent
URL: http://joyent.com/product/features

Software Name: Croquet **Company:** Viewpoints Research
URL: http://www.opencroquet.org/

Software Name: CVS **Company:** Ximbiot
URL: http://ximbiot.com/cvs/manual/

Software Name: Ecco **Company:** Tomoye
URL: https://acc.dau.mil/CommunityBrowser.aspx?id=22792

Software Name: eGroupWare **Company:** eGroupWare
URL: http://www.egroupware.org/

Software Name: Ekiga **Company:** Ekiga
URL: http://www.gnomemeeting.org/

Software Name: Elluminate Live! **Company:** Elluminate, Inc.
URL: http://www.elluminate.com/enterprise_edition.jsp#FEATURES

Software Name: Epiware **Company:** Epiware
URL: http://www.epiware.com/

Software Name: Exchange Server **Company:** Microsoft
URL: http://www.microsoft.com/technet/prodtechnol/exchange/default.mspx

Software Name: FirstClass **Company:** SoftArc
URL: http://www.softarc.com/

Software Name: Forum ZX **Company:** Sitescape
URL: http://www.sitescape.com/products/forum_zx_features.php

Software Name: Generic Applications **Company:** Things Prime
URL: http://www.thingsprime.com/prime/extranet/389

Software Name: GoToMeeting **Company:** Citrix
URL: https://www.gotomeeting.com/en_US/m/g2mFeatureslp.tmpl?RURL=m%2Fg2mLMlp.tmpl

Software Name: Groove Virtual Office **Company:** Groove Networks
URL: http://www.groove.net/home/index.cfm

Software Name: GroupVille **Company:** Sendai Systems
URL: http://www.groupville.com/overview1.html

Software Name: Groupwise **Company:** Novell
URL: http://www.novell.com/products/groupwise/features.html

Software Name: GroveSite 4.0 **Company:** GroveSite
URL: http://www.grovesite.com/features.asp

Software Name: Horde Framework **Company:** Horde Project
URL: http://www.horde.org/

Software Name: Hula **Company:** Novell
URL: http://hula-project.org/Hula_Project

Software Name: Kolab **Company:** Kolab
URL: http://www.kolab.org/

Software Name: Live Communications **Company:** Microsoft
URL: http://www.microsoft.com/office/livecomm/prodinfo/compare.mspx

Software Name: LiveMeeting **Company:** Microsoft
URL: http://www.microsoft.com/office/livemeeting/prodinfo/default.mspx

Software Name: Lotus Notes **Company:** IBM
URL: http://www-142.ibm.com/software/sw-lotus/products/product4.nsf/wdocs/notesoverview

Software Name: Marratech **Company:** Marratech
URL: http://www.marratech.com/

Software Name: MediaWiki **Company:** Wikimedia Foundation Inc.
URL: http://www.mediawiki.org/wiki/MediaWiki

Software Name: Meeting Space **Company:** Microsoft
URL: http://www.microsoft.com/windows/products/windowsvista/features/details/meetingspace.mspx

Software Name: My Teamwork **Company:** Alcatel
URL: http://www.alcatel.com/products/productsummary.jsp?repositoryID=/com/en/appxml/opgproduct/myteamworktcm228455541635.jhtml

Software Name: MyWebDesktop **Company:** MyWebDesktop
URL: http://www.mywebdesktop.net/

Software Name: NetMeeting **Company:** Microsoft
URL: http://www.microsoft.com/windows/NetMeeting/Features/default.ASP

Software Name: Nuxeo Collaborative **Company:** Nuxeo
URL: http://www.cps-project.org/

Software Name: ODS/Virtuoso **Company:** OpenLink Software
URL: http://virtuoso.openlinksw.com/wiki/main/Main/OdsIndex

Software Name: Office Groove **Company:** Microsoft
URL: http://office.microsoft.com/en-us/groove/FX100487641033.aspx

Software Name: OpenGroupware **Company:** SKYRIX Software AG
URL: http://www.opengroupware.org/

Software Name: Open-Xchange **Company:** Open-Xchange Inc.
URL: http://www.open-xchange.com/EN/

Software Name: PabloDraw **Company:** Eto
URL: http://pablo.etoxn.ca/PabloDraw.aspx

Software Name: phpGroupWare, **Company:** Free Software Foundation Inc
URL: http://www.phpgroupware.org/

Software Name: PHProjekt **Company:** PHProjekt
URL: http://www.phprojekt.com/features.php

Software Name: RallyPoint **Company:** WBPSystems
URL: http://rallypoint.wbpsystems.com/index.php

Software Name: Scalix **Company:** Scalix
URL: http://www.scalix.com/

Software Name: Scoop **Company:** Kuro5hin
URL: http://scoop.kuro5hin.org/

Software Name: ShareDirect **Company:** Laplink Software
URL: http://www.laplink.com/sharedirect/features.html

Software Name: Sharepoint **Company:** Microsoft
URL: http://www.microsoft.com/sharepoint/default.mspx

Software Name: Simple Groupware **Company:** Simple Groupware Solutions
URL: http://www.simple-groupware.de/cms/Main/Features

Software Name: Skype **Company:** Skype
URL: http://www.skype.com/

Software Name: SlashCode **Company:** SlashDot
URL: http://www.slashcode.com/

Software Name: SocialText **Company:** SocialText
URL: http://www.socialtext.com/products/features

Software Name: SubEthaEdit **Company:** TheCodingMonkeys
URL: http://www.codingmonkeys.de/subethaedit/

Software Name: TalkAndWrite **Company:** Collective Soft
URL: http://www.talkandwrite.com/english/index.php

Software Name: TeamLinks **Company:** Imera
URL: http://www.imera.com/index.html

Software Name: Tiki CMS/Groupware **Company:** Tikiwiki
URL: http://doc.tikiwiki.org/tiki-index.php?page=Features

Software Name: TUTOS **Company:** TUTOS
URL: http://www.tutos.org/homepage/index.html

Software Name: Ventrilo **Company:** Flagship Industries
URL: http://www.ventrilo.com/about.php

Software Name: VIP Task Manager **Company:** VIP Quality Software
URL: http://www.taskmanagementsoft.com/products/taskmanager/features.php

Software Name: Virtual Office **Company:** ContactOffice
URL: http://www.contactoffice.com/description/product/features.jsp?locale=en_UK&menu=Product&item=Features

Software Name: Visual Source Safe **Company:** Microsoft
URL: http://msdn.microsoft.com/vstudio/previous/ssafe/productinfo/features/

Software Name: WebAsyst **Company:** WebAsyst
URL: http://www.webasyst.net/

Software Name: WebDAV **Company:** IETF WebDAV Working
URL: http://www.webdav.org/

Software Name: WebOffice **Company:** WebEx
URL: http://www.webex.com/solutions/weboffice-features.html

Software Name: Workplace **Company:** IBM
URL: http://www-128.ibm.com/developerworks/lotus/library/ls-lwp1/

Software Name: WorkSpot **Company:** WorkSpot
URL: http://www.workspot.com/features/

Software Name: WorkZone **Company:** Trichys
URL: http://www.trichys.com/home/features/features-overview.vm

Software Name: Worskpace3D **Company:** Tixeo Soft
URL: http://www.tixeo.com/Features.htm

Software Name: Writely (Beta) **Company:** Google
URL: http://www.writely.com

Software Name: Zarafa **Company:** Zarafa
URL: http://www.zarafa.com/

Software Name: Zimbra **Company:** Zimbra Inc.
URL: http://www.zimbra.com/pdf/Zimbra%20Collaboration%20Suite%20Feature%20List.pdf

Software Name: ZingThing **Company:** Zing
URL: http://www.anyzing.com/businesstitles.html

Software Name: Zon **Company:** Sitescape
URL: http://www.sitescape.com/products/zon_features.php

Software Name: Zope **Company:** Zope Corporation
URL: http://www.zope.org/

APPENDIX B

LIST OF SOFTWARE FEATURES

Feature	Description	Software Company
ActiveSync	Exchange ActiveSync is designed to work with these high-latency, low-bandwidth networks and transfer information quickly between Microsoft Exchange Server and your mobile device. Exchange ActiveSync can synchronize e-mail messages, contacts, calendar, and task data. With the addition of Unified Messaging to your organization, you can also synchronize voice mail and fax messages attached to e-mails in your Inbox.	Exchange Server Microsoft
Address Book Sharing	The Microsoft Internet Directory is a Web site provided and maintained by Microsoft to locate people to call on the Internet.	NetMeeting Microsoft
Address Book Sharing	Shared address book available through project launchbar. Synchronizes changes.	Groove Virtual Office Groove Networks
Address Book Sharing	Share users, groups and external contacts with automatic address update option	GroupVille Sendai Systems
Address Book Sharing	Personal and Group address books. Manages address book and contact information.	Virtual Office ContactOffice
Address Book Sharing	Rolodex style index card view includes rich content to each card including links to messages, pictures, etc.	FirstClass SoftArc
Address Book Sharing	Keep contacts personal or open to the group. Table view of all project members.	PHProjekt PHProjekt
Address Book Sharing	Turba is the Horde address book / contact management program. It provides a generic frontend to searching and managing LDAP, SQL, IMSP, and several other contact sources.	Horde Framework Horde Project
Address Book Sharing	Allows sharing of contact information	Citadel Citadel
Address Book Sharing	Address Book: Contact-manager using SQL or LDAP. InfoLog: Powerful replacement for ToDo, Notes and Phonecalls, CRM customer relationship management.	eGroupWare eGroupWare
Address Book Sharing	Shared contact information.	Kolab Kolab
Address Book Sharing	Shared address book for contact information.	Open-Xchange Open-Xchange Inc.

Feature	Description	Software Company
Address Book Sharing	Saves and organizes thousands of personal and company contacts, telephone, fax, addresses, e-mail contact addresses just to mention a few. Easily configurable with extensive and speedy search capabilities, categorization and remotely accessible.	OpenGroupware SKYRIX Software AG
Address Book Sharing	Shared address book for contact information.	phpGroupWare, Free Software Foundation Inc
Address Book Sharing	You probably manage your contacts in Outlook. But with Zarafa, you can share your business contacts through a public contacts folder. Even distribution lists can be created, so you may send the same email easily to a group.	Zarafa Zarafa
Address Book Sharing	Business card view of Contacts. List view of Contacts with preview pane. Ability to import/export Contacts in .csv format. Ability to import/export contacts in vCard (.vcf) format. Ability to print a single Contact or list of Contacts and see a print preview. Right-clicking a Contact displays a menu of actions to take on the Contact (e.g. compose message, search for messages). Ability to drag a Contact to a mini-calendar date to create an appointment with that Contact.	Zimbra Zimbra Inc.
Address Book Sharing	AR/AP CRM: Customer and Contact Information shared through web interface. Customer Info, File Area, Ledger, Activity History, Notes, Etc.	24SevenOffice 24SevenOffice
Address Book Sharing	Web interface for managing contacts.	Simple Groupware Simple Groupware Solutions
Address Book Sharing	Lists – Windows SharePoint Services sites can store lists of information, including announcements, tasks, contacts, and custom lists. Additionally, you can use the search engine in SharePoint Portal Server 2003 to search the contents of lists across all of your	Sharepoint Microsoft
Address Book Sharing	Create, Edit and Delete Human Resources, Group Resources by Columns, Sort Resources within Columns, Assign Human Resource to Roles	VIP Task Manager VIP Quality Software
Address Book Sharing	Store team members' information in the Contact Directories application. It is designed to hold information for contacts both inside and outside a company.	WebOffice WebEx

Feature	Description	Software Company
Address Book Sharing	A web-based system that organizes clients, business colleagues, employees, vendors, as well as personal contacts. This centralized contact storage efficient communication with contacts to share files and notes, manage projects, track issues, send bulk SMS and e-mail messages etc.	WebAsyst WebAsyst
Address Book Sharing	Access all your important contact information wherever you are. Plugs in to Exchange, Notes, or	BlackBerry Enterprise Server Research in Motion
Address Book Sharing	People Finder and My Contacts are portlets that help you find anyone in your organization.	Workplace IBM
Address Book Sharing	Zon automatically collects contact information enterprise-wide, from IM systems, e-mail servers, corporate directories and contact management systems -- no importing or synchronization necessary. Just click on contacts to initiate a conference or share your	Zon Sitescape
Address Book Sharing	Web Client for shared/personal address book entries.	Connector Joyent
Alerts	Alerts – Alerts are messages that inform users when content that they are interested in changes in some way. An alert message can be delivered in an e-mail message or in a Web Part on a SharePoint site. Users can choose to receive alerts about a relevant content source, such as a document library or a list. These alerts help users stay current with the latest version of the content that is important to their work.	Sharepoint Microsoft
Application Sharing	Application sharing allows any user connected to the workspace to run all software installed on the computer.	Worskpace3D Tixeo Soft
Application Sharing	Share a specific application running on the desktop.	Baloka Meeting Room Batipi
Application Sharing	Share a specific application running on the desktop.	Balinga Meeting Room Batipi
Application Sharing	Share a specific application running on the desktop.	Baranga Meeting Room Batipi
Application Sharing	Share a specific application with participants.	GoToMeeting Citrix

Feature	Description	Software Company
Application Sharing	Can share applications among several participants. The software includes several applications that get installed along with the toolkit, such as the Shared Browser for viewing the Web together and the Shared Presentation for power point presentations. However, the Access Grid is not limited to pre-installed applications. Developers may create and plug in custom applications that can be made available for venue participants.	Access Grid Argonne National Lab
Application Sharing	Share a specific application running on the desktop.	Elluminate Live! Elluminate, Inc.
Application Sharing	View shared programs in a frame, which makes it easy to distinguish between shared and local applications on your desktop. Minimize the shared program frame and do other work if you do not need to work in the current conference program. Easily switch between shared programs using the shared program taskbar. hoose to allow one person to work in the shared program at a time. Approve conference participants' requests to work in the program you introduce. Allow or prevent others from working in a program using the Sharing dialog box.	NetMeeting Microsoft
Application Sharing	Marratech allows you to share any application with the rest of the group and dynamically work within it, sharing information in real-time across Windows, Mac and Linux systems.	Marratech Marratech
Audio Conferencing	VoIP provides networked audio for collaboration.	Marratech Marratech
Audio Conferencing	TeamLinks allows for real time voice communication among distributed teams, between individuals or among groups via built-in voice capabilities. Uses VoIP.	TeamLinks Imera
Audio Conferencing	Send receive audio to or from machines over the network by placing a "Call"	NetMeeting Microsoft
Audio Conferencing	Provides multi-party conferencing with audio. PSTN (‘reservationless’) audio conferencing integration, with control of the conference (add/eject/mute participants, lock conference, end conference) Also, PBX	Live Comm. Server Microsoft
Audio Conferencing	Carry out live virtual meetings (using VoIP?)	Groove Virtual Office Groove Networks
Audio Conferencing	Full-duplex voice over the Internet	Elluminate Live! Elluminate, Inc.

Feature	Description	Software Company
Audio Conferencing	Calls transmitted: When you receive a phone call for a group member while he is away, send him a message in a structured way: caller name, subject, priority, etc. Received calls: Access to your phone messages, transmitted by group members.	Virtual Office ContactOffice
Audio Conferencing	One-on-one chatting with participant.	Tiki CMS/Groupware Tikiwiki
Audio Conferencing	Access Grid (AG) is used for large-scale distributed meetings, collaborative work sessions, seminars, lectures, tutorials, and training.	Access Grid Argonne National Lab
Audio Conferencing	Participants can communicate with one another while connected to the network.	Croquet Viewpoints Research Institute,
Audio Conferencing	Provides audio conferencing using VoIP	GoToMeeting Citrix
Audio Conferencing	Audio Conferencing using VoIP. Optional Push to talk mode.	Ventrilo Flagship Industries
Audio Conferencing	Audio Conferencing using VoIP. Integrates easily with existing voice and data networks, corporate address books and Microsoft Outlook/Exchange.	Zon Sitescape
Audio Conferencing	You can talk to anyone on Skype over the Internet for free, and you'll always be able to do that. There are some other useful things you can do on Skype that aren't free. SkypeOut is a cheap way to call from Skype to landlines and mobile phones. You can also use SkypeOut to forward calls to your Skype to your home number or mobile phone. SkypeIn is a number your friends can call from any phone and you pick up the call in Skype. You can get numbers in one or more of the places offered, and receive calls in Skype from anywhere in the world. Skype Voicemail. Skype Voicemail takes your calls when you're busy or offline.	Skype Skype
Audio Conferencing	VoIP: The underlying software-based server provides a "SIP-to-the-Core" architecture intrinsically suited to multimedia collaboration, without specialized hardware.	My Teamwork Alcatel
Audio Conferencing	VoIP provides networked audio for collaboration.	Worskpace3D Tixeo Soft
Audio Conferencing	Supports teleconferencing between multiple users using VoIP.	Ekiga Ekiga

Feature	Description	Software Company
Audio Conferencing	VoIP powered by Skype Plug-in.	TalkAndWrite Collective Soft
Audio Conferencing	Meet online, in real-time with customer and colleagues, give presentations, demonstrate products, conduct training, etc.	WebOffice WebEx
Audio Conferencing (Reservationless)	Launch a conference without any reservations,	Baranga Meeting Room Batipi
Auditing	Conference can be recorded for auditing backup.	Baranga Meeting Room Batipi
Auditing	Rules can be placed on content that will perform audits based on specified instructions.	Alfresco Alfresco Software, Inc.
Auditing	Sessions are recordable for auditing.	Elluminate Live! Elluminate, Inc.
Auditing	Marratech can record all media (voice, video, whiteboard and chat) and index your recordings. You can easily record your meetings or lectures, play them back later, or send them to others.	Marratech Marratech
Auditing	At the end of a session, TeamLinks provides the ability to send a transcript of the meeting. This captures decisions, provides information for process improvement, and aids with compliance.	TeamLinks Imera
Blog		Lotus Notes IBM
Blog	Blog content manager. For journal/discussion based collaboration.With BLOG, it is possible to have a BLOG to which a ›GROUP of authors contribute rather than just one.	Generic Applications Server Things Prime
Blog	Online diaries or journals with discussion.	Tiki CMS/Groupware Tikiwiki
Blog	Blog with discussion links allows users to keep a web "journal" with comments.	Confluence Altassian
Blog	Comprehensive blogging platform with all major feeds, API's, integration to third party services.	ODS/Virtuoso OpenLink Software

Feature	Description	Software Company
Blog	Once you've created a document, you can post it to your blog. Any tags you've added to your document will become the post's blog categories.	Writely (Beta) Google
Bookmark Sharing	Bookmark list for a quick access to important URL's.	PHProjekt PHProjekt
Bookmark Sharing	Tracks and organizes web sites in a bookmark management system.	ODS/Virtuoso OpenLink Software
Bookmark Sharing	Trean is a bookmarks manager for Horde, allowing you to store your bookmarks in one place and access them from any browser. Bookmarks can be grouped into categories which can be shared with arbitrary users.	Horde Framework Horde Project
Bookmark Sharing	Bookmark list for a quick access to important URL's.	Simple Groupware Simple Groupware Solutions
Bookmark Sharing	Manages user-submitted Web links.	Tiki CMS/Groupware Tikiwiki
Bookmark Sharing	Personal or Group bookmarks. Manages user-submitted Web links. RSS feed available.	Virtual Office ContactOffice
Bookmark Sharing	Share and edit a list of bookmarks during the	Balinga Meeting Room Batipi
Bookmark Sharing	Tag Bookmarks or use webagent to follow changes to files or notes.	MyWebDesktop (Beta) MyWebDesktop
Bookmark Sharing	Share and edit a list of bookmarks with community.	Ecco Tomoye
Brainstorming	Multiple Cursors allow brainstorming synchronously	ZingThing Zing
Brainstorming	Multiple Cursors allow brainstorming synchronously	AnyZing Zing
Calendar Sharing	For each workspace you create in WorkZone, you can activate a group calendar to share activities, milestones or deadlines with team members. Create color-coded categories for items to let them stand out on the calendar, or filter the calendar to see only a single category's items. Access group schedules and deadlines from anywhere you have access to the	WorkZone Trichys

Feature	Description	Software Company
Calendar Sharing	With the shared calendar, keep track of team member availability, group meetings and events. With the built-in permissions system, share access to calendars with colleagues, while maintaining the privacy of personal meetings.	WebOffice WebEx
Calendar Sharing	Manage and schedule appointments while you're on the go. Plugs in to Exchange, Notes, or Groupwise.	BlackBerry Ent. Server Research in Motion
Calendar Sharing	Group/Individual Calendar sharing.	Groupwise Novell
Calendar Sharing	Create, Edit and Delete Employees Schedules, Schedule Tasks, Events, Appointments, etc, Display Assigned and Unassigned Tasks, Display Tasks for a Certain Time Period	VIP Task Manager VIP Quality Software
Calendar Sharing	Communities can store time-sensitive information including meetings, reminders and project milestones in one or more community calendars. The Calendar tool supports recurring entries, user and role-based reminders, support for international time zones and more. If two or more calendars are setup in the same community, a global community calendar is provided to display a consolidated view of all entries. Calendar entries can be cross-referenced with any other community content item and can be moderated.	CommunityZero Ramius Corporation
Calendar Sharing	Offers a personal calendar for keeping track of your appointments.	Workplace IBM
Calendar Sharing	View calendars for yourself, your team, or the entire Forum. Trade calendar entries using Microsoft Outlook.	Forum ZX Sitescape
Calendar Sharing	Web client for private/group calendar.	Connector Joyent
Calendar Sharing	Show deadlines, schedule meetings, share vacation plans... all in calendar pages that your teams can view online.	GroveSite 4.0 GroveSite

Feature	Description	Software Company
Calendar Sharing	Personal Calendar: By default, all data can be accessed by yourself only. Share your personal agenda and access shared agendas. Layer agendas to quickly view timezones available for several people Access rights for group members (view details, add, delete) Private events. Group Calendar: By default, all data can be accessed by all group members. Both Calendars have 4 RSS feeds: Today, This week, This month, 30 days (from today)	Virtual Office ContactOffice
Calendar Sharing	Group/Individual Calendar sharing. System Events Calendar helps Administrators to automate any additional tasks they want to run at various	FirstClass SoftArc
Calendar Sharing	Events calendar with public, private and group	Tiki CMS/Groupware Tikiwiki
Calendar Sharing	Allows scheduling between users and groups.	BaseCamp 37signals
Calendar Sharing		Lotus Notes IBM
Calendar Sharing	News: News makes it easy to create and maintain a listing of dated events.n News mode, items which are dated for the future are not rendered, so you can set something to be published only from a specific date and time. In News mode, you set a parameter to determine how long, how many days, items remain current. Items which are no longer current appear in the	Generic Applications Server Things Prime
Calendar Sharing	A place to post one-time and repeating events (such as meetings and vacations). Keep in mind that the calendar is public, and any event you post will be seen by all members of the web group.	Epiware Epiware
Calendar Sharing	Group/Individual Calendar sharing. Manage appointents, tasks, activities.	24SevenOffice 24SevenOffice
Calendar Sharing	Ability to schedule personal appointments. Ability to schedule meetings and view attendees' free/busy information. Ability to create recurring meetings and exceptions to recurring meetings. Ability to book resources (locations, equipment, etc.) for a meeting. Ability to search for available resources by attributes such as site, building, floor, and capacity. Ability to configure a resource to auto-respond to scheduling requests based on availability. Option to enable an alert popup for upcoming appointments	Zimbra Zimbra Inc.

Feature	Description	Software Company
Calendar Sharing	Create appointments for you or a colleague. When your colleague allows it, you can easily open his or her calendar. It is also possible to create a shared calendar for the company or department.	Zarafa Zarafa
Calendar Sharing	Group/Individual Calendar server for sharing and scheduling events.	phpGroupWare, Free Software Foundation
Calendar Sharing	Group/Individual Calendar server for sharing and scheduling events.	Scalix Scalix
Calendar Sharing	Allows scheduling between users and groups.	Citadel Citadel
Calendar Sharing	Manage meetings and events for an entire group or individual set of accounts. Attach notes to appointments. Link appointments to contacts and projects. Automatic detection of conflicts.	OpenGroupware SKYRIX Software AG
Calendar Sharing	Group/Individual Calendar server for sharing and scheduling events.	Open-Xchange Open-Xchange Inc.
Calendar Sharing	Powerful calendar which also supports scheduling of groups, resources and even contacts.	eGroupWare eGroupWare
Calendar Sharing	Group/Individual Calendar server for sharing events.	Kolab Kolab
Calendar Sharing	The Kronolith calendar provides a robust web-based calendar for any number of users or groups, with the ability to show any number of calendars in a single overlaid view. Users can create any number of calendars and grant read, edit, or full permissions to any user, group, or any combination thereof.	Horde Framework Horde Project
Calendar Sharing	Web based calendar designed with HCI and heuristics in mind. Group/Individual Calendar sharing by Invitation	Hula Novell
Calendar Sharing	Single mode: views for day, week, month and full list. Group mode: view schedules of several users together.	PHProjekt PHProjekt
Calendar Sharing	Group/Individual Calendar server for sharing and scheduling events.	Simple Groupware Simple Groupware Solutions
Calendar Sharing	Group/Individual Calendar server for sharing and scheduling events.	Nuxeo Collaborative Portal Nuxeo

Feature	Description	Software Company
Cluster Support	Linux Cluster system architecture increases speed and improves failsafe measures. Uptime as a feature? Reliablity and fewer patches listed as a bonus.	Groupwise Novell
Co-Browse	You can simultaneously work with several people in information research thanks to our collaborative Web Browser. Using Microsoft IE, this web browser is compatible with most Internet standards.	Worskpace3D Tixeo Soft
Co-Browse	Navigate on the fly to any website, and share the view with attendees.	Balinga Meeting Room Batipi
Co-Browsing	View websites and surf websites in conference display.	Zon Sitescape
Code Sharing	Chora is the Horde repository viewer, and it provides an advanced web-based view of any CVS, RCS, or Subversion repository. It includes annotation support, visual branch viewing capability, and human-readable diffs. It powers http://cvs.horde.org/ and hundreds of other web cvs interface sites.	Horde Framework Horde Project
Content Sharing	The foundation for Live Meeting interactivity is its ability to broadcast visuals of any type, including presentations, commonly used document types such as Microsoft® Word and Excel, applications, or web pages to remote participants in real-time. Presenters can choose to share either a portion of their desktop or the entire screen.	LiveMeeting Microsoft
Dashboard	Project management for a collaborative environment. Schedule, Update, View, and Modify tasks. (Plugs into MS Project)	Groove Virtual Office Groove Networks
Dashboard	View milestones, deadlines, projects, recent activity,	BaseCamp 37signals
Dashboard	Web Portal style interface for Project Dashboard.	Horde Framework Horde Project
Dashboard	Key functions displayed in a central location. New email messages, Daily appointments, Progress on tasks, Milestones achieved, Group broadcasts.	Open-Xchange Open-Xchange Inc.

Feature	Description	Software Company
Dashboard	My Workplace consists of tabs that correspond to main areas of Lotus Workplace functionality. The tabs displayed in My Workplace are determined by the access you have to Lotus Workplace products. For example, in the preceding screen, you have access to Lotus Workplace Messaging (Mail, Calendar, and Address Book), Lotus Workplace Team Collaboration (Web Conferences and Team Spaces), and Lotus Workplace Collaborative Learning. If, on the other hand, you only had access to Lotus Workplace Messaging, you would only see the Mail, Calendar, and Address Book tabs in My Workplace.	Workplace IBM
Dashboard	A highly visible note board is made available for announcements and informal discussion. It is ideal for encouraging participation, posting general comments, or drawing additional attention to new content. Notes can be cross-referenced and be moderated.	CommunityZero Ramius Corporation
Data Sharing	Databases provide a powerful and easy way to collect and share structured information. This tool is completely configured via a Web browser with user-defined fields and saved "views". The database can be populated and searched by any community member. Typical uses include: database of resources, tasks, related websites, directories, event registrations, surveys and more. Databases are stored in user-defined folders, can be cross-referenced and be moderated.	CommunityZero Ramius Corporation
Data Sharing	Manage and manipulate mission-critical information and share it with team members. Choose from eight ready-made templates or create your own database from the ground up.	WebOffice WebEx
Data Sharing	Web Services – SharePoint Portal Server 2003 can use Web services to expose data and functionality. Web services are reusable modular pieces of code that developers and end-users can use to access server functionality and data with minimal development effort.	Sharepoint Microsoft
Data Sharing	BlackBerry Mobile Data System™ (BlackBerry MDS™) is an optimized framework for creating, deploying and managing applications for the BlackBerry Enterprise Solution. It provides essential components that enable applications beyond email to be deployed to mobile users, including developer tools, administrative services and BlackBerry device software. It also uses the same proven BlackBerry push delivery model and advanced security features used for BlackBerry email.	BlackBerry Ent. Server Research in Motion

Feature	Description	Software Company
Data Sharing	Simple reports and graphical summaries help examine and manage the status of workflows, tasks, and entries in discussion forums and calendars.	Forum ZX Sitescape
Data Sharing	GroveSite custom data tables are as easy to set up and maintain as all of the other page types. Some common data table templates are provided with the GroveSite 4.0 Pro product and, for a very small setup fee, you can have new tables designed for your specific needs.	GroveSite 4.0 GroveSite
Data Sharing	Keep track of your company's resources such as automobiles, projectors or conference rooms. Searchable timeslots to check for availability of specific resources or resources assigned to a specific group. Automatically check for resource conflicts upon	OpenGroupware SKYRIX Software AG
Data Sharing	Allow the sharing of web services for data sharing.	Access Grid Argonne National Lab
Data Sharing	Share Sales Data. View Sales Data, Analysis, and Forecasting. Reporting Tools.	24SevenOffice 24SevenOffice
Data Sharing	Forms and Reports record or present data.	Groove Virtual Office Groove Networks
Data Sharing	With DATABASE you create a pseudo-database simply by specifying field names. Then automatically get an input form via which you (and your collaborating colleagues) may enter records. The output is a sortable web listing which may be formatted, access protected, and published in the usual way. Also includes the same functionality for a	Generic Applications Server Things Prime
Data Sharing		Lotus Notes IBM
Data Sharing	Data reports: Generate simple PDF reports of content. Also several add-on modules for industry specific KM tools or CMS.	GroupVille Sendai Systems

Feature	Description	Software Company
Desktop Sharing	The Sharing Frame lets presenters select a specific area of their desktop they would like to share with meeting participants. For example, if there is only a portion of a confidential Word or Excel document the presenter would like to show to an audience, Live Meeting lets them select and share only that portion, while keeping the rest of the document private and unseen. Remote Control allows the presenter to hand control of any document, application, or even their desktop to any remote participant. This means that both the presenter and the participant have full control of that application. This can be especially useful in environments where interactive collaboration with co-workers is necessary. Similarly, Remote Assistance allows presenters in a Live Meeting to initiate application or desktop sharing on a remote participant's desktop. This is particularly useful in helpdesk or customer support roles. For security reasons, the remote participant can grant or deny access to the session initiator.	LiveMeeting Microsoft
Desktop Sharing	Remote Desktop Sharing lets you operate a computer from a remote location. Collaborate with another user sharing the same desktop.	NetMeeting Microsoft
Desktop Sharing	Share desktop with participants.	GoToMeeting Citrix
Desktop Sharing	Take over an atendees desktop with permission.	Balinga Meeting Room Batipi
Desktop Sharing	Share Desktop with attendees.	Baloka Meeting Room Batipi
Desktop Sharing	Share Desktop with attendees.	Baranga Meeting Room Batipi
Desktop Sharing	Make one desktop available to multiple users simultaenously, for collaboration over the web. The user that creates a desktop session sets up who has access to it, using the "Share the Desktop" function. The "Join" function is for users to access a desktop session offered by another Workspot user (see above). The person who creates the desktop session determines who can access a session and what level of access they have (Full or View Only).	WorkSpot WorkSpot
Desktop Sharing	Share Desktop with attendees.	Balinga Meeting Room Batipi

Feature	Description	Software Company
Desktop Sharing	Desktop sharing allows any user connected to the workspace to share its desktop. Each user can see a demo of particular software or take the control of the shared desktop to participate to a document's edition. Audio and video conferencing are still available during desktop sharing.	Worskpace3D Tixeo Soft
Document Presentation	Upload documents prior to your meeting or during that can be retrieved from your personal document repository and share with your meeting attendees. Documents are converted to HTML format.	Balinga Meeting Room Batipi
Email	Every time you post a document or make a comment, WorkZone lets you send an email alert to other users. Once the email is received, the user simply clicks on the link to go directly to the folder or comment log that contains the new content.	WorkZone Trichys
Email	Application mail clients are available on the GNU/Linux desktop. In particular, Ximian Evolution is pre-configured to work with your workspot.net e-mail! An HTML-based interface to your Workspot.net email is also included.	WorkSpot WorkSpot
Email	WebAsyst Mail Master™ is a practical bulk email marketing software tool which allows creates and sends permission-based e-mail communications to customers, subscribers, team members, and prospects.	WebAsyst WebAsyst
Email	BlackBerry is a wireless extension of your email mailbox that allows clients to send, receive, forward and reply to messages. It integrates seamlessly with existing enterprise email accounts or personal email accounts. Also has the option to create a new BlackBerry email address.	BlackBerry Ent. Server Research in Motion
Email	E-mail with status and retraction.	Groupwise Novell
Email	Web Email client. Advanced features like right-click menus, drag-and-drop functionality, keyboard hotkeys and fast page updates provide for ease of use. Also set up custom rules to automatically manage and sort mail.	WebOffice WebEx
Email	Mailing Lists	CommunityZero Ramius Corporation

Feature	Description	Software Company
Email	IBM Lotus Workplace Messaging integrates with your existing email infrastructure, to route mail and to manage users using your LDAP directory.	Workplace IBM
Email	Provides Web Client for email.	Connector Joyent
Email	Email integrates with LDAP. Synchronize accounts with LDAP directories, and automatically create accounts using LDAP information.	Forum ZX Sitescape
Email	Send and receive webmail (POP3), Instant Messages (IM) and SMS.	GroupVille Sendai Systems
Email	Domino Mail Server.	Lotus Notes IBM
Email	Sets up a group listserv that posts to a forum page.	Generic Applications Server Things Prime
Email	Gives users Web-based access to their POP3 e-mail accounts.	Tiki CMS/Groupware Tikiwiki
Email	Web Based Email, Group Access to email, Email notification of site changes.	Confluence Altassian
Email	Email server	FirstClass SoftArc
Email	Web Email Client. Gather all your email addresses (POP3, Hotmail, MSN and Lycos) in a single interface that you can access everywhere.	Virtual Office ContactOffice
Email	Web Access to Email.	24SevenOffice 24SevenOffice
Email	Linux based email server that works with Outlook client. Besides your own mail, you may also view mail of others, when the owner of the mailbox allowed you to the access the mail. Spam can be delivered in a separate junk mail folder.	Zarafa Zarafa
Email	Email Server	Scalix Scalix
Email	Multiple email clients	Scalix Scalix
Email	Web interface for viewing, sending, responding to	phpGroupWare, Free Software Inc

Feature	Description	Software Company
Email	Automatic grouping of messages in a message thread, enabling efficient message organization. Conversations are formed independently of folders, meaning that messages in different folders can be part of the same conversation. If a new message is contributed to a conversation, that conversation is marked as unread and moved to the top of the Inbox. Ability to perform actions on an entire conversation such as move, Tag, flag, drag/drop, etc. Ability to view a highlighted message in a preview pane. Ability to create personal folders and folder hierarchies. Ability to generate RSS or ATOM feeds based on the contents of the Inbox or other mail folders. Ability to subscribe to RSS/ATOM feeds.	Zimbra Zimbra Inc.
Email	Email server and List Srver	Citadel Citadel
Email	IMAP mail-client	eGroupWare eGroupWare
Email	IMAP or POP3 Server	Kolab Kolab
Email	The integrated (IMAP4 based) e-mail client offers a comfortable environment for reading and creating e-mails as well as organizing email by folders. A global, and configurable contact directory eliminates the endless search for the correct e-mail address.	OpenGroupware SKYRIX Software AG
Email	Web interface for viewing, sending, responding to	Open-Xchange Open-Xchange Inc.
Email	Web client for viewing, sendig, responding to email.	ODS/Virtuoso OpenLink Software
Email	Web based Email Client designed with HCI and heuristics in mind	Hula Novell
Email	IMP: IMP provides webmail access to any IMAP or POP3 mailbox, and handles internet standard MIME attachments, user defined filters, preferences, and more. DIMP: DIMP is a alternate presentation view of IMP using AJAX-ish technologies to create a more dynamic user experience (DIMP stands for Dynamic	Horde Framework Horde Project
Email	MIMP: MIMP is a stripped down version of IMP for use on mobile phones, PDAs, and anything with a small screen or limited HTML support.	Horde Framework Horde Project

Feature	Description	Software Company
Email	DIMP: DIMP is a alternate presentation view of IMP using AJAX-ish technologies to create a more dynamic user experience (DIMP stands for Dynamic IMP).	Horde Framework Horde Project
Email	Ingo is an email filter rules manager. It can generate Sieve, procmail and IMAP scripts and upload them to or execute them on the server (using a timsieved or VFS FTP driver, or the PHP IMAP extension,	Horde Framework Horde Project
Email	Sork is a collection of four other Horde modules: accounts [CVS], forwards [CVS], passwd [CVS], and vacation [CVS]. Together they perform various account management functions such as changing passwords, setting up e-mail forwards, and setting up e-mail vacation notices (auto responder messages).	Horde Framework Horde Project
Email	Web interface for viewing, sending, responding to	Nuxeo Collaborative Portal Nuxeo
Email	Web email client.	Simple Groupware Simple Groupware Solutions
Email	Web interface for viewing, sending, responding to	PHProjekt PHProjekt
Ephemerides	Content that varies by date.	Tiki CMS/Groupware Tikiwiki
Feedback	Emotion and activity indicators.	Elluminate Live! Elluminate, Inc.
Feedback	Chili peppers are used as an icon for rating content by community members.	Ecco Tomoye
Feedback	Questionairre Tool allows for group composition, attitudes and performance feedback.	AnyZing Zing
Feedback	Questionairre Tool allows for group composition, attitudes and performance feedback.	ZingThing Zing
Feedback (Body Language)	Studies show that body language is a major part in communication. This is why we integrated gestures and contextual information thanks to 3D. This allows to know very easily by looking around you, "who" is doing "what", "where" and "how", which is really important for communication. Time saving and enhanced efficiency, 3D reduces distances between	Worskpace3D Tixeo Soft
Feedback (Hand Raising)	Allows participant to raise "Hand" during conference.	Baranga Meeting Room Batipi

Feature	Description	Software Company
Feedback (Marker and Pointer)	Emphasizing a point within the presentation.	Baranga Meeting Room Batipi
FeedBack (Member List)	An online presence indicator shows how many users are online. Also, the Member List area provides a powerful and automated method to track and review community membership. The list indicates when members joined and their most recent visit. Access to detailed membership profiles is provided here.	CommunityZero Ramius Corporation
Feedback (User Discovery and Awareness Location)	Accept/Reject/Invite participants, view participant's status and working location	TalkAndWrite Collective Soft
Feedback (User Discovery and Awareness Location)	The TeamLinks window gives you instant awareness of any member's availability in real time. This significantly shortens the time required to access expert knowledge or collaborate in real time to make critical product decisions.	TeamLinks Imera
Feedback (User Discovery and Awareness Location)	The Seating Chart provides a real-time view of the number of attendees and their feedback on the meeting pace and clarity. The configuration of the seating chart is based on the size of the audience, and is selected at scheduling. A large meeting might be represented by a row of presenters and many rows of attendees, a smaller meeting may show a round table with a few attendees surrounding it. Audience members can change their seat colors to visually communicate their level of understanding or desired pace without interrupting the session. Meeting organizers can customize the Mood Indicators by assigning different meanings to the seat colors displayed in the seat color legend.	LiveMeeting Microsoft
Feedback (User Discovery and Awareness Location)	Discovers users and their shared documents automatically in a local area network. Users can opt to join any discovered shared document. For all this, no configuration is necessary because it is based on zero-conf networking (also known as Bonjour or Rendezvous). Awareness information includes the cursor and the currently selected text of the other users marked with the color of the respective user.	ACE ACE Project Team
File Sharing	Web Interface and hooks into Windows Explorer.	Alfresco Alfresco Software, Inc.
File Sharing	Web based interface to file sharing, searching, file meta data and application content.	ODS/Virtuoso OpenLink Software

Feature	Description	Software Company
File Sharing	Gollem is a web-based File Manager, providing the ability to fully manage a hierarchical file system stored in a variety of backends such as a SQL database, as part of a real filesystem, or on an FTP server.	Horde Framework Horde Project
File Sharing	Files can be maniplated in this virtual setting.	Croquet Viewpoints Research Institute,
File Sharing	Files, intranet links and directories. Table view of all group related documents. Restricted access system for each file.	PHProjekt PHProjekt
File Sharing	Has a web interface for sharing files	Nuxeo Collaborative Portal Nuxeo
File Sharing	Web based interface to file sharing, searching, file meta data and application content.	Open-Xchange Open-Xchange Inc.
File Sharing	Share documents and files, locally or remotely, in groups or privately in a project centric environment.	OpenGroupware SKYRIX Software AG
File Sharing	Managing files stored in the VFS (virtual file system) based on files, sql-db or webdav.	eGroupWare eGroupWare
File Sharing	The Venue Client allows you to share data among users of the venue. Files can either belong to the venue or be user specific. The user may carry around personal data when walking between venues.	Access Grid Argonne National Lab
File Sharing	Ability to upload Attachments as Documents. Ability to embed rich content objects as independently editable items inside a web Document.	Zimbra Zimbra Inc.
File Sharing	Web Access to Upload/Download Files.	24SevenOffice 24SevenOffice
File Sharing	Nested Tree Structure called Library. Version Control, Properties, Access Log.	Epiware Epiware
File Sharing	Web interface for sharing files.	Simple Groupware Simple Groupware Solutions

Feature	Description	Software Company
File Sharing	Document Libraries – Each Windows SharePoint Services site can host one or more document library. Documents stored across all document libraries are fully indexed and searchable through SharePoint Portal Server 2003. Using document libraries, you can create, edit, and upload documents, check documents in and out, and track past versions of documents	Sharepoint Microsoft
File Sharing	File transfer lets you send one or more files in the background during a NetMeeting conference.	NetMeeting Microsoft
File Sharing	A lightweight document repository application, making it easy to create a hierarchical web-based file system, with file-versioning, check-in/check-out (file locking)	Generic Applications Server Things Prime
File Sharing	Share files across multiple computers as if they were one. team. Files will remain in sync once editing has completed or on save. Receive notifications of	Groove Virtual Office Groove Networks
File Sharing	File Transfer capabilities	Elluminate Live! Elluminate, Inc.
File Sharing	Personal and Group document management. Access your online documents easily from a special folder on your operating system desktop (Windows, Macintosh, Linux): drag and drop, opening and saving from the	Virtual Office ContactOffice
File Sharing	Allows useers to share files through web interface.	CollabNet CollabNet
File Sharing	Computer files and software for downloading.	Tiki CMS/Groupware Tikiwiki
File Sharing	Attach Files to Wiki pages	Confluence Altassian
File Sharing	File sharing in Message Board format.	BaseCamp 37signals
File Sharing	Upload Files to Database and Attach Links to Files or WebPages, Open and Save Attachments.	VIP Task Manager VIP Quality Software
File Sharing	Share documents, files, and other content that is of common interest to your team, including remote workers, customers, suppliers, and business partners. Your authorized users have secure access to important files at any time from anywhere. Pinpoint the information you need in just seconds with Advanced Search and the optional Full-Text Search feature.	WebOffice WebEx

Feature	Description	Software Company
File Sharing	ShareDirect lets you connect any folders on your PC to any number of users instantly and securely. Create your own private and secure document-sharing network with authenticated ShareDirect Members directly from Window Explorer.	ShareDirect Laplink Software
File Sharing	Upload documents and view document versions. View and sort all files. Link to files in the wiki. Display uploaded images within your pages. Full-text search of many attached files	SocialText SocialText
File Sharing	Has a web interface for sharing files.	RallyPoint WBPSystems
File Sharing	The File Sharing area enables members to securely store and share any type of computer file. Word documents, Adobe Acrobat PDF files, software programs, video and audio files can all be stored securely. Files are stored in user-defined folders, can be cross-referenced and be moderated. Folders can be set to restrict upload or download of files if desired. The Files tool supports lightweight document management features such as version control and check-in/check-out functionality.	CommunityZero Ramius Corporation
File Sharing	Get a private space for files, bookmarks and notes or make public by invitation.	MyWebDesktop (Beta) MyWebDesktop
File Sharing	WorkSpace3D's file space allows connected users to share files. When a user adds a file to the workspace it is automatically sent to other users and stays available for any new participant because a copy is done on WorkSpace3D server.	Worskpace3D Tixeo Soft
File Sharing	Upload documents prior to your meeting or during that can be retrieved from your personal document repository and share with your meeting attendees. Documents are converted to HTML format.	Baloka Meeting Room Batipi
File Sharing	Posting a document to WorkZone is as easy as attaching a document to an email message. Just browse for the document on your desktop or server and load it on WorkZone for access by the whole project team. Share documents of any type and size, without regard for limits placed by email or firewalls.	WorkZone Trichys
File Sharing	Create online document storage, organize files in folders. Keep and share your photos, MP3s and videos online. Create user groups and customize access rights. Access documents from anywhere with just a web browser.	WebAsyst WebAsyst

Feature	Description	Software Company
File Sharing	The lateset Gnome Nautilus file manager is available on the GNU/Linux-desktop-through a-browser. An HTML-based file manager is also included, where you can upload and download files, move files between folders, add/modify/delete files, etc.	WorkSpot WorkSpot
File Sharing	WebDav: You can also create a secure network folder from your windows or mac machine to your workspot. Workspot is WebDAV compatible. WebDAV stands for "Web-based Distributed Authoring and Versioning". It allows users to edit and manage files on remote servers. Using your favorite WebDAV client you can access your directories on Workspot.net.	WorkSpot WorkSpot
File Sharing	WebDAV provides a network protocol for creating interoperable, collaborative applications. Major features of the protocol include: Locking (concurrency control): long-duration exclusive and shared write locks prevent the overwrite problem, where two or more collaborators write to the same resource without first merging changes. To achieve robust Internet-scale collaboration, where network connections may be disconnected arbitrarily, and for scalability, since each open connection consumes server resources, the duration of DAV locks is independent of any individual network connection. Properties: XML properties provide storage for arbitrary metadata, such as a list of authors on Web resources. These properties can be efficiently set, deleted, and retrieved using the DAV protocol. DASL, the DAV Searching and Locating protocol, provides searches based on property values to locate Web resources. Namespace manipulation: Since resources may need to be copied or moved as a Web site evolves, DAV supports copy and move operations. Collections, similar to file system directories, may be created and listed.	WebDAV IETF WebDav Work Group
File Sharing	Share documents, files, and other content that is of common interest to the community.	Ecco Tomoye
File Sharing	Simplify document review and editing with automated check-out/check-in and versioning, "edit-in-place" revisions, HTML file viewer, centralized document storage, multi-file upload/download, graphical views of document folders, and more.	Forum ZX Sitescape
File Sharing	GroveSite offers a way to share documents and collaborate with colleagues, clients and vendors via a web environment.	GroveSite 4.0 GroveSite

Feature	Description	Software Company
File Sharing	Web Client fot uploading/downloading documents.	Connector Joyent
File Sharing	The CVS repository stores a complete copy of all the files and directories which are under version control. Normally, you never access any of the files in the repository directly. Instead, you use CVS commands to get your own copy of the files into a working directory, and then work on that copy. When you've finished a set of changes, you check (or commit) them back into the repository. The repository then contains the changes which you have made, as well as recording exactly what you changed, when you changed it, and other such information. Note that the repository is not a subdirectory of the working directory, or vice versa; they should be in separate locations.	CVS Ximbiot
FileSharing	Check in and check out file locking securely protects files from accidental overwrite by preventing more than one user from modifying the same file at the same time. Maintain an audit trail for every file. View the changes—when they were made and who made them—and even print reports. Difference reporting provides quick, visually enhanced access to changes across different versions of the same file.	Visual Source Safe Microsoft
Geographical	Navigable, interactive maps with user-selectable layers (requires mapserver)	Tiki CMS/Groupware Tikiwiki
Geographical	(3rd Party) Link GroupVille data with geographical data (Flash maps).	GroupVille Sendai Systems
Image Editing	An open-source multi-user ansi/ascii editor for	PabloDraw Eto
Image Sharing	Collections of graphic images for viewing or downloading (photo album)	Tiki CMS/Groupware Tikiwiki
Image Sharing	Web Gallery for sharing photos and images	Simple Groupware Simple Groupware Solutions
Image Sharing	Web based photo gallery to upload, organize, display and share photos.	ODS/Virtuoso OpenLink Software
Image Sharing (3D)	Using the 3D viewer, you will be able to load a 3D model and look at it from any angle. It can be used for instance, to show a part to customers and partners.	Worskpace3D Tixeo Soft
Instant Messaging	Allows users to synchronously exchange messages.	Groupwise Novell

Feature	Description	Software Company
Instant Messaging	Draw and chat with your friends with multi-user editing.	PabloDraw Eto
Instant Messaging	Allows users to synchronously exchange messages.	Ekiga Ekiga
Instant Messaging	Allows users to synchronously exchange messages.	MyWebDesktop (Beta) MyWebDesktop
Instant Messaging	Secure Instant Messaging available "in browser".	My Teamwork Alcatel
Instant Messaging	Allows users to synchronously exchange messages.	Worskpace3D Tixeo Soft
Instant Messaging	One or more users can be selected to begin an instant conversation.	CommunityZero Ramius Corporation
Instant Messaging	ommunicate in realtime with individual ShareDirect members. ShareDirect messaging is protected by 256-bit encryption - the highest level commercially	ShareDirect Laplink Software
Instant Messaging	Enjoy many features familiar to you in the desktop version of your instant messaging software, including contact list management, presence awareness, notifications and emoticons. BlackBerry now supports the following instant messaging platforms: Yahoo! Messenger, IBM Lotus Sametime, Novell GroupWise Messenger, Windows Messenger / Live Communications Server 2005,Google Talk for BlackBerry Devices.	BlackBerry Ent. Server Research in Motion
Instant Messaging	Allows users to exhange synchronous messages.	Balinga Meeting Room Batipi
Instant Messaging	Allows users to synchronously exchange messages.	GoToMeeting Citrix
Instant Messaging	Allows users to synchronously exchange messages. Similar to IRC Interface.	Ventrilo Flagship Industries
Instant Messaging	Allows users to synchronously exchange messages.	Forum ZX Sitescape
Instant Messaging	Instant Messaging and offers chat between groups and individuals.	Workplace IBM
Instant Messaging	There's an on-screen chat window for spreadsheets and documents.	Writely (Beta) Google

Feature	Description	Software Company
Instant Messaging	Allows users to synchronously exchange messages.	Simple Groupware Simple Groupware Solutions
Instant Messaging	Allows users to synchronously exchange messages.	PHProjekt PHProjekt
Instant Messaging	Allows users to synchronously exchange messages.	Nuxeo Collaborative Portal Nuxeo
Instant Messaging	Built in Jabber client for IM.	Access Grid Argonne National Lab
Instant Messaging	Allows users to synchronously exchange messages.	Citadel Citadel
Instant Messaging	Real-time group text chatting	Tiki CMS/Groupware Tikiwiki
Instant Messaging	Send instant messages to team members and alerts you when updates have been made.	Collanos Workplace Collanos Software
Instant Messaging	Allows users to synchronously exchange messages.	Virtual Office ContactOffice
Instant Messaging	Allows users to synchronously exchange messages.	Elluminate Live! Elluminate, Inc.
Instant Messaging	TeamLinks provides always on, instant messaging to any member in your peer list. Instantly communicate within and outside your domain to quickly resolve	TeamLinks Imera
Instant Messaging	Chat directly within shared folders. Available through Project Launchbar.	Groove Virtual Office Groove Networks
Instant Messaging	Use Marratech's text message facility for informal notes with all participants. Use it to gather or post questions, clarify names, spelling, web links and email	Marratech Marratech
Instant Messaging	Allows users to synchronously exchange messages.	Live Comm. Server Microsoft
Instant Messaging	Chat lets you conduct real-time conversations via text, with as many people as you like.	NetMeeting Microsoft
Instant Messaging	Chats are a useful way to communicate with other attendees or presenters during a meeting. All chat is private between participants. Presenters can always chat with each other and can enable or disable the audience chat feature.	LiveMeeting Microsoft

Feature	Description	Software Company
Invitations	The key to a successful community is getting others involved and generating participation. The Invite Others tool gives members the ability to e-mail automated invitations to interested parties. All invitations sent are tracked and can be resent if	CommunityZero Ramius Corporation
Message Board	Threaded discussion boards remove the need for high-volume e-mail mailing lists and provide an automated way to centralize conversations and decisions for future reference. A centralized discussion archive contributes greatly to an organization's ability to manage collective knowledge and experiences. Discussion topics are stored in user-defined folders, can be cross-referenced and be moderated. Folders and individual Topics can be subscribed to by members wishing to receive near real-time updates by e-mail. Replies can be posted by e-mail and may include attachments for automatic posting into the community.	CommunityZero Ramius Corporation
Message Board	Post, edit, reply to messages.	MyWebDesktop (Beta) MyWebDesktop
Message Board	Exchange important ideas and information in structured, hierarchical "threads" that make reading and responding easy. Usable for managing joint file editing, team projects, brainstorming and other	WebOffice WebEx
Message Board	All documents in WorkZone include a comment log that allows everybody to share their thoughts, provide direction, or give approval. The log remains associated with the document throughout its life in WorkZone. Compare that to saving comments in your email inbox or putting them in a folder deep in your filing cabinet. Each time a comment is made, WorkZone automatically creates an email alert that can be sent to all users, or to those you select. And, the alert includes a link that takes users directly into the document's comment log for fast and easy response.	WorkZone Trichys
Message Board	Post, edit, reply to messages.	GroupVille Sendai Systems
Message Board	Post, edit, reply to messages.	Virtual Office ContactOffice
Message Board	Post, edit, reply to messages	Generic Applications Server Things Prime
Message Board	Post, edit, reply to messages	CollabNet CollabNet

Feature	Description	Software Company
Message Board	Post, edit, reply to messages	BaseCamp 37signals
Message Board	Discussion threads occurring about the content within your wiki	Confluence Altassian
Message Board	Allows users to post, edit, reply to messages	Citadel Citadel
Message Board	The Newsboard gives you the opportunity to publish important information or articles to the Intranet. Defineable headlines that can be linked to other related articles or news items. In addition, the Newsboard shows upcoming appointments and tasks and serves as a personal page.	OpenGroupware SKYRIX Software AG
Message Board	Post, edit, reply to messages.	Open-Xchange Open-Xchange Inc.
Message Board	Post, edit, reply to messages.	Simple Groupware Simple Groupware Solutions
Message Board	Once in the forum (Figure 5-25) you can add messages, search by keyword, and arrange existing posts by subject, author, or date by clicking the relevant column headings. All members can add messages and search the forum, but only root users and administrators can add, edit, or delete forums.	Epiware Epiware
Message Board	Post, edit, reply to messages.	Nuxeo Collaborative Portal Nuxeo
Message Board	Post, edit, reply to messages.	SlashCode SlashDot
Message Board	Post, edit, reply to messages.	PHProjekt PHProjekt
Message Board (Blog)	Scoop is a "collaborative media application". It falls somewhere between a content management system, a web bulletin board system, and a weblog.	Scoop Kuro5hin
Message Boards	Team Spaces are named places in which team members communicate and share information.	Workplace IBM

Feature	Description	Software Company
Message Boards	Discussions in Ecco automatically roll-up (aggregate) under one place in the community (note that discussions only roll up within a community). This will make it much easier for community leaders/facilitators to monitor and respond to discussions. One of the challenges with Simplify was that members would initiate discussions or ask questions and they were buried and essentially not visible. This new feature should greatly foster the responsiveness of the community to users. A user may subscribe to the discussion area.	Ecco Tomoye
Message Boards	GroveSite's Discussion Forums provide an alternative for team collaboration. A dispersed or multi-company team can post messages and respond to messages via a web environment.	GroveSite 4.0 GroveSite
Multiple Presenters/Control	Pass conference control to multiple parties	Baranga Meeting Room Batipi
News	Announcements: Announcements keeps a group up-to-date on the most critical information they need to get their job done. By allowing for critical information to be relayed.	WebOffice WebEx
News	Slash is the source code and database that was originally used to create Slashdot, and has now been released under the GNU General Public License.	SlashCode SlashDot
News	Fast-breaking news, announcements. Submission & approval. Topics & Types.	Tiki CMS/Groupware Tikiwiki
News	Web based interface to file sharing, searching, file meta data and application content.	ODS/Virtuoso OpenLink Software
News Sharing	Newsletter:With NEWSLETTER one manages Editions. Create sophisticated HTML editions of the NEWSLETTER and then use NEWSLETTER to communicate them to your audience. Users maintain pending editions while you work on them.	Generic Applications Server Things Prime
News Sharing	A means of publishing short (Messages of the Day) or long (News Items) articles that will show up on all members' My Desktop.	Epiware Epiware
Note Sharing	Store and share ideas.	Simple Groupware Simple Groupware Solutions

Feature	Description	Software Company
Note Sharing	Save your personal memos and thoughts. Keep notes private or open to the group. Copy or mail to another user.	PHProjekt PHProjekt
Note Sharing	Mnemo is a note manager. It has the same sharing features as Kronolith and Nag, allowing workgroups to have a common notepad as well as private notes for individuals.	Horde Framework Horde Project
Note Sharing	Users can write, upload, download and read notes. Notes can be read as raw text files or as Wiki pages interpreting the Wiki markup syntax. The user-quota that admin can control is used to set the maximum size that user notes can take.	Tiki CMS/Groupware Tikiwiki
Note Sharing	Personal and Group note sharing. Users can write, upload, download and read notes.	Virtual Office ContactOffice
Note Sharing	WebAsyst Quick Notes™ is a web based online notepad for down notes and memos, organize them in folders and share those folders with others. Create online storage for your notes and memos. Organize entries in folders, and customize access rights for every folder. Easily retain and find your announcements, message templates, marketing ideas, technical instructions. Print notes using templates; customize templates using built-in HTML editor. Access notes from anywhere with just a web browser.	WebAsyst WebAsyst
Note Sharing	Compose, edit and delete important notes and memos anywhere. Plugs in to Exchange, Notes, or Groupwise.	BlackBerry Ent. Server Research in Motion
Note Sharing	Create, Edit and Delete Notes, Change Font Size, Name, Style, Color in RTF Editor, Set Text Alignment, Preview and Print Notes	VIP Task Manager VIP Quality Software
Note Sharing	Consistent across Joyent applications is the ability to leave and receive comments on just about any item: files, calendar items, even shared emails. Team input and feedback has never been easier to gather.	Connector Joyent
Phone	BlackBerry devices feature a built-in, high quality phone that supports voice services with optional call waiting, call answer, conference calling and call forwarding. Also BlackBerry 7270 supports standards-based Session Initiated Protocol (SIP) call control over an 802.11b-compliant Wireless LAN for interoperability with a wide range of IP telephony and traditional PBX	BlackBerry Ent. Server Research in Motion

Feature	Description	Software Company
Polling	Vote on agenda during the conference	Baranga Meeting Room Batipi
Polling	Vote on agenda during the conference	Balinga Meeting Room Batipi
Polling	Create, distribute and report on an online survey for a workspace. Build consensus among team members or simply understand opinions of shareholders.	WebOffice WebEx
Q&A	In-meeting IM lets you ask questions without interrupting.	Zon Sitescape
Q&A	Audience members can ask questions and get answers without interrupting the presenter. While one person is presenting, any other presenter can serve as moderator and immediately respond to questions submitted from audience members. Answers can be provided directly to the questioner (private reply) or shared with the entire audience (post to all). Live Meeting allows for an unlimited number of Q&A moderators.	LiveMeeting Microsoft
Quiz	Interactive quiz manager.	Elluminate Live! Elluminate, Inc.
Quiz	Timed questionnaire with recorded scores.	Tiki CMS/Groupware Tikiwiki
Region Sharing	Select and highlight a specific area of the desktop or an application to share with attendees. For privacy	Balinga Meeting Room Batipi
Region Sharing	Select and highlight a specific area of the desktop or an application to share with attendees. For privacy	Baloka Meeting Room Batipi
Resource Sharing	Performs resource sharing and synchronous computation among multiple users. Using Croquet, software developers can create powerful and highly collaborative multi-user 2D and 3D applications and	Croquet Viewpoints Research Inst.
RSS	RSS News feed	Confluence Altassian
RSS	News feed enabled for projects etc.	BaseCamp 37signals
RSS	Grab and publish RSS. Also used to take input from other GA Server application instances. (Ex: BLOG, WIKI, MEETING, FORUM, etc.)	Generic Applications Server Things Prime

Feature	Description	Software Company
RSS	RSS news and FAQ	GroupVille Sendai Systems
RSS	Subscribe to updates through RSS.	SocialText SocialText
RSS	Everyone can remain informed with RSS. Files, notes and the FAQ are all presented in RSS form so that you can remain informed without visiting the site.	RallyPoint WBPSystems
RSS	Joyent offers rich support for RSS. Each group in every app can be subscribed to as an RSS feed. So, for example, you could subscribe to an email mailbox, and the feed would be updated with each new message in that mailbox. Or, you could subscribe to a calendar, in which case that feed would contain the upcoming events in that calendar.	Connector Joyent
Shoutbox	Graphical box allows users to post messages and simple graphics.	Tiki CMS/Groupware Tikiwiki
SMS	Allows users to synchronously exchange messages over cellular network.	Virtual Office ContactOffice
SMS	(3rd Party) Send SMS to over 140 countries from your GroupVille client browser.	GroupVille Sendai Systems
SMS	Skype SMS lets you send SMS messages to your friends' mobile phones from Skype. (Not a free feature.)	Skype Skype
SMS	SMS (Short Messaging Service) enables you to easily send and receive short text messages using your BlackBerry device without adding email messages to an inbox.	BlackBerry Enterprise Server Research in Motion
Synchronization	You can also work off-line. When the connection is established or re-established, all modifications will be updated.	TalkAndWrite Collective Soft
Synchronization	Ability to work online and offline. Workspaces synchronize transparently with team members.	Collanos Workplace Collanos Software
Task Sharing	Manage your personal tasks by priority. Assign tasks to group members and to the follow-up online. Assignation of tasks may have accompanying SMS	Virtual Office ContactOffice

Feature	Description	Software Company
Task Sharing	To do list. Can send tasks to other users. Also shared group tasks.	Tiki CMS/Groupware Tikiwiki
Task Sharing	Automatic reminders for important items	GroupVille Sendai Systems
Task Sharing	TODO makes it easy to create tasks by email, whether this is something you do (when using an instance as a personal TODO List) or one of your clients (when using an instance as a ticketing tool).	Generic Applications Server Things Prime
Task Sharing	Lists – Windows SharePoint Services sites can store lists of information, including announcements, tasks, contacts, and custom lists. Additionally, you can use the search engine in SharePoint Portal Server 2003 to search the contents of lists across all of your	Sharepoint Microsoft
Task Sharing	Nag is a multiuser task list manager. Users can create any number of "task lists", which can be shared with individual users, groups, or any combination. Any number of task lists can be viewed in a single list. Tasks have due dates, completion times, and can be imported and exported in multiple formats.	Horde Framework Horde Project
Task Sharing	Shared To-Do Lists. User with chief status assigns todos to others.	PHProjekt PHProjekt
Task Sharing	Action Items: A place to assign and track tasks and action items.	Epiware Epiware
Task Sharing	Shared To-Do Lists.	phpGroupWare, Free Software Foundation
Task Sharing	Besides your personal list of todo's, a shared task list is also available. By using this list, you can see in one overview which tasks are still open. Detail your tasks with information like time, date, owner and priority. You can even send tasks over the email to your colleagues.	Zarafa Zarafa
Task Sharing	You may organize tasks by person, group or specific project. "Todo" lists can be ordered by priority, due date, processing status etc. An overview of all tasks is stored in the projects application as well as sorted by company. All tasks are also summarized on the	OpenGroupware SKYRIX Software AG
Task Sharing	Tasks can be hierachicly orded by assigning subtasks.	Kolab Kolab

Feature	Description	Software Company
Task Sharing	Create, Edit and Delete To Do Lists, Change Tasks Priority and Order, Group Tasks by Columns, Sort Tasks within Columns	VIP Task Manager VIP Quality Software
Task Sharing	Keep track of personal action items or delegate tasks to subordinates or members of a project team. Follow the progress of a task from start to completion and view status by owner, project, or other criteria.	WebOffice WebEx
Task Sharing	Add, edit and delete tasks. Also mark tasks as complete while you're away from your desk. Plugs in to Exchange, Notes, or Groupwise.	BlackBerry Ent. Server Research in Motion
Text Editing	Connect teams in two or more locations using a combination of Zing's Internet software and Zing multiplexer kits and keyboards. The software connects teams of up to 12 people at each site into the conference through a single computer.	ZingThing Zing
Text Editing	Tracks Multiple Cursors Requires a single computer, a data projector (or several monitors via a VGA splitter) and several keyboards which are connected to the computer via a USB hub or serial multiplexor.	AnyZing Zing
Text Editing	Open documents (doc , pdf, xls, ppt etc…) When connected, the current page is sent to participant automatically.	TalkAndWrite Collective Soft
Text Editing	[Best in Show] A sophisticated technique allows all users to type anywhere in the text without locking parts of the text for other users, making SubEthaEdit just as easy to use as a traditional text editor. Bells and whistles for coding, pair programming, demonstrations, and note taking. Exports to web page with meta data	SubEthaEdit TheCodingMonkeys
Text Editing	WorkSpace3D's text editor allows a simultaneous editing of the same document. All the classic editor features are present, as it can edit RTF files (Rich Text Format). With this application, all connected users in WorkSpace3D can edit the same paragraph or the same line of the document simultaneously.	Worskpace3D Tixeo Soft
Text Editing	Notebook application allowing collaborative writing.	MyWebDesktop (Beta) MyWebDesktop

Feature	Description	Software Company
Text Editing	The stated goal of the WebDAV working group is (from the charter) to "define the HTTP extensions necessary to enable distributed web authoring tools to be broadly interoperable, while supporting user needs", and in this respect DAV is completing the original vision of the Web as a writeable, collaborative	WebDAV IETF WebDav Work Group
Text Editing	Synchronous text editor that runs across all major platforms, including Windows, Linux, and Mac. Simple text editor with standard features such as copy/paste and load/save.	ACE ACE Project Team
Text Editing	Draft: DRAFT makes it easy collaboratively to author a document via the web. Draft documents have hierarchical structure (sections containing paragraphs) and may be exported to Word (RTF) on completion of the drafting process.	Generic Applications Server Things Prime
Text Editing (Docs and Spreadsheets)	Invite people to your documents/spreadsheets and make changes together, at the same time. On screen revisions show you exactly who changed what, and	Writely (Beta) Google
Text Editing (Multiple Document)	Multiple documents can be edited at the same time. Furthermore, ACE can share documents with other users on different computers, connected by communication networks.	ACE ACE Project Team
Text Slide	A text slide is a blank editable page that lets presenters communicate with text. For example, a presenter can type new information that is available to the audience to copy and paste, such as an action items list or notes from brainstorming sessions. When a text slide is created, it allows the presenter to use the Edit menu commands to copy, paste, cut, and delete text.	LiveMeeting Microsoft
Text Slide	This application allows you to perform slides presentation from a PowerPoint ® file to all users connected to the workspace	Worskpace3D Tixeo Soft
Timetracking	Track the status of ongoing projects from a wide range of dimensions. You can view and update a project's status by project name, category, task, priority, responsibility, due date, current status or percent complete. Changes to key fields are recorded in an activity log, so that you can refer back to them later if you want to review your processes.	WorkZone Trichys
Timetracking	Track time spent on projects and tasks.	BaseCamp 37signals

Feature	Description	Software Company
Timetracking	Assign working days to several projects. Shows all users who are '@ work'. Monthly overview.	PHProjekt PHProjekt
Timetracking	Time-tracker application well integrated with projectmanager.	eGroupWare eGroupWare
Unified Messaging	This server role allows you to combine all types of messages in one Inbox that users can access from a telephone, a computer, or a mobile device. Before Exchange 2007, most IT departments managed their voice mail and fax messages separately from their e-mail. Often, to provide all three types of messaging required three different systems: a PBX and voice mail server for voice mail messages, stand-alone fax machines or a centralized fax server, and an Exchange server. Unified Messaging combines all of those systems into one Inbox.	Exchange Server Microsoft
User Discovery and Awareness	Just like instant messengers, you can also use Skype to chat and not just with one other person at a time, but with up to 100 people in a group chat. If it’s a really nice group chat, you can bookmark it and find it later, which is handy for persistent chats with family or business contacts.	Skype Skype
User Discovery and Awareness	Presence offers chat and presence awareness.	Workplace IBM
User Location and Awareness	Presence (indication of an individual's online or 'on-phone' status) in all documents and discussions allows instant collaboration	Forum ZX Sitescape
User Location and Awareness	Know instantly who is available, on the phone, or already in a conference before starting an impromptu meeting. Contact participants automatically via their preferred method (IM, e-mail, various phones or any combination), reducing phone tag and interruptions.	Zon Sitescape
Video Conferencing	Video conferencing through integrated system. Integrates easily with existing voice and data networks, corporate address books and Microsoft Outlook/Exchange.	Zon Sitescape
Video Conferencing	Provides multi-party desktop conferencing with video, and interactive VoIP.	Baloka Meeting Room Batipi
Video Conferencing	Web Based Multimedia Conferencing: Full web conferencing and video capability.	My Teamwork Alcatel

Feature	Description	Software Company
Video Conferencing	Provides multi-party conferencing with video.	Worskpace3D Tixeo Soft
Video Conferencing	Provides multi-party conferencing with video, and interactive VoIP.	Ekiga Ekiga
Video Conferencing	Meet online, in real-time with customer and colleagues, give presentations, demonstrate products, conduct training, etc.	WebOffice WebEx
Video Conferencing	Send receive video w/ audio to or from machines over the network by placing a "Call"	NetMeeting Microsoft
Video Conferencing	H.264 gives high quality video on Windows, Linux and Mac at substantially lower bit rates than other systems still relying on earlier standards. Users can switch to full screen video, opening web-based conferencing to image critical applications such as remote medical diagnosis and university science	Marratech Marratech
Video Conferencing	Provides multi-party conferencing with video. PC-PC Video communication with CIF-sized video window, expandable to full screen and new, bandwidth efficient video codec	Live Comm. Server Microsoft
Video Conferencing	(3rd Party) Transfer video and/or slides. There are two options: A basic streaming solution for simple needs. An Enterprise Streaming solution with optional hardware for speakers.	GroupVille Sendai Systems
Video Conferencing	Provides multi-party conferencing with video.	Elluminate Live! Elluminate, Inc.
Video Conferencing	Access Grid (AG) is used for large-scale distributed meetings, collaborative work sessions, seminars, lectures, tutorials, and training.	Access Grid Argonne National Lab
Video Conferencing	Video is possible but unconfirmed. Although users can visually interact through their virtual representations. Very much like an online game.	Croquet Viewpoints Research Inst.
Voice Streaming	Stream a listen only audio file to attendees	Balinga Meeting Room Batipi
Voting	Allows Anonymous/Identifible posting and voting on agenda items.	ZingThing Zing

Feature	Description	Software Company
Voting	Allows Anonymous/Identifible posting and voting on agenda items.	AnyZing Zing
Voting	Communities can overcome decision roadblocks and effectively reach consensus through live opinion polls. Polls are effective for gauging opinions, agreeing on meeting times, testing knowledge and more. Multiple polls can be concurrently active. Votes are tabulated in real-time and can be set to collect anonymous or named votes. Security ensures users can only vote once if desired. User can create polls in advance with a fixed start and close date for automatic introduction and removal of polls over time.	CommunityZero Ramius Corporation
Voting	Select individual persons for a vote. Table view of all actual and past votings.	PHProjekt PHProjekt
Voting	Interactive survey manager	Elluminate Live! Elluminate, Inc.
Voting	Questionnaire with multiple choice or open ended question.	Tiki CMS/Groupware Tikiwiki
Voting	Polls allow presenters to receive instant feedback from their audience in real-time, as seen in the accompanying screen shot. Polls can be created in advance using Microsoft PowerPoint or during the meeting by clicking the poll button. The poll will be instantly displayed or hidden (based on the presenters' preference) and audience votes are tallied dynamically. At the end of the session a polling report can show how specific individuals voted as well as aggregate totals.	LiveMeeting Microsoft
Web Slide	Web slides let presenters take their audience to any live Web site on the Internet to give tours, point attendees toward surveys or online information. Each attendee can independently click on links, fill out forms, or use interactive media. Organizers can add web slides to presentations quickly and easily just by entering the address of the Web site (URL) such as http://www.microsoft.com/livemeeting. The preview feature allows the presenter to see the page before it is shown to the audience in case additional navigation is needed prior to sharing it with the audience.	LiveMeeting Microsoft
Web Slide	Deliver presentations, display documents through a slide show format.	Zon Sitescape

Feature	Description	Software Company
Web Slide	Web Conferences let you conduct on-line meetings in which a moderator delivers an on-line presentation to other conference attendees.	Workplace IBM
Webpage Editing	GroveSite provides simple wiki-style tools that make it easy for you to create your own content within minutes; saving both time and money. Your designated site managers can edit any page in your site and the updates will appear instantly on your site.	GroveSite 4.0 GroveSite
Webpage Editing	WebAsyst Quick Pages™ is a powerful, easy to use visual web based software tool which creates and instantly publishes web pages, tutorials, user manuals, employee handbooks, user guides or help systems with a hierarchical Table of Contents.	WebAsyst WebAsyst
Whiteboard	Mark-up shared content	Balinga Meeting Room Batipi
Whiteboard	Mark-up shared content.	Baloka Meeting Room Batipi
Whiteboard	The white board allows to edit an image collaboratively. All tools for viewing a picture or editing a diagram are present : pencil, eraser, line, basic geometric shapes. Imports a large number of file	Worskpace3D Tixeo Soft
Whiteboard	Provides tools to draw, highlight, or point out things of interest on screen during conference.	GoToMeeting Citrix
Whiteboard	Interactive whiteboard with saved annotations.	Zon Sitescape
Whiteboard	whiteboard is a blank page that allows presenters to draw, add text, and highlight information by using the annotation tools. For example, organizers can quickly create a flow chart to illustrate a point, insert a whiteboard and then use the annotation tools to draw squares, lines, and a host of other figures. The slide can be saved for future reference.	LiveMeeting Microsoft
Whiteboard	Mark-up shared content.	Live Comm. Server Microsoft
Whiteboard	You can upload images, documents, live camera snapshots, presentations and other application windows to your Marratech whiteboard, all while talking to and viewing others in your meeting. Use tele-pointers, highlighters, colors, and other tools to explain, emphasize, and annotate ideas and results.	Marratech Marratech

Feature	Description	Software Company
Whiteboard	The whiteboard lets you collaborate in real time with others via graphic information.	TeamLinks Imera
Whiteboard	The whiteboard lets you collaborate in real time with others via graphic information. Review, create, and update graphic information. Manipulate contents by clicking, dragging, and dropping information on the whiteboard with the mouse. Cut, copy and paste information from any Windows-based application into the Whiteboard. Use different-colored pointers to easily differentiate participants' comments. Save the Whiteboard contents for future reference. Load saved Whiteboard pages, enabling you to prepare information before a conference, then drag and drop it into the Whiteboard during a meeting.	NetMeeting Microsoft
Whiteboard	Ability to mark-up shared content on drawing board.	Elluminate Live! Elluminate, Inc.
Wiki	Includes a Wiki content manager.	Generic Applications Server Things Prime
Wiki	Content Management through a wiki interface. Wiki Style Linking between pages.	Confluence Altassian
Wiki	Wiki based content management.	GroupVille Sendai Systems
Wiki	Content Management using the Wiki interface and linking scheme. A wiki is a type of website that allows the visitors themselves to easily add, remove and otherwise edit and change some available content, sometimes without the need for registration. This ease of interaction and operation makes a wiki an effective tool for collaborative authoring. The term wiki can also refer to the collaborative software itself (wiki engine) that facilitates the operation of such a website, or to certain specific wiki sites, including the computer science site (an original wiki), WikiWikiWeb, and online encyclopedias such as Wikipedia.	MediaWiki Wikimedia Foundation Inc.
Wiki	Collaboratively authored documents with history of changes.	Tiki CMS/Groupware Tikiwiki
Wiki	Edit, delete, modify, store and share content in a collaborative web-based user interface.	ODS/Virtuoso OpenLink Software

Feature	Description	Software Company
Wiki	Ability to create a Wiki as a Document repository and as a mechanism for navigating through Documents. Ability to create multiple Wikis in a single mailbox. Ability to create a Wiki that is shared by everyone within a domain. "WikiWords" in web Documents automatically create links to other web Documents referenced by the WikiWords	Zimbra Zimbra Inc.
Wiki	.A group-editable website. Wikis are composed of web pages you can write on, enabling fast and easy collaboration. Simple WYSIWYG “What You See Is What You Get” editing.	SocialText SocialText
Workflow	Web Parts – Web Parts are modular pieces of code that you can embed in a portal page. You can use Web Parts for many purposes, including access to data, information, or applications. In an application integration environment, you can use Web Parts to provide user access to business applications through the portal, making the applications easy to find and embedding them in a familiar context. The portal can also provide services like single sign-on and personalization for the Web Part, which simplifies integration for the user.	Sharepoint Microsoft
Workflow	Provides workflow for Tracking cars, payments, units, and other things associated with HOAs.	RallyPoint WBPSystems
Workflow	BlackBerry Mobile Data System™ (BlackBerry MDS™) is an optimized framework for creating, deploying and managing applications for the BlackBerry Enterprise Solution. It provides essential components that enable applications beyond email to be deployed to mobile users, including developer tools, administrative services and BlackBerry device software. It also uses the same proven BlackBerry push delivery model and advanced security features used for BlackBerry email.	BlackBerry Ent. Server Research in Motion
Workflow	WebAsyst Issue Tracker™ is a web based issue tracking software tool which automates the business processes, in whole or part, so that documents, information, tasks and/or bugs are passed from one participant to another for action, according to a set of procedural rules - workflow. Add issues online, e.g. work orders, bug and defect reports. Assign a person responsible for implementation. Forward issues from one state to another according to a specified workflow scheme, e.g. In Progress -> Testing -> Complete. Customize workflow scheme for every project/task. Share issue list with customers and co-workers.	WebAsyst WebAsyst

Feature	Description	Software Company
Workflow	Expense report workflow: Submit all work-related expenses for reimbursement. Customizable to meet the needs of different organizations by defining expense categories, mileage reimbursement rate and local currency.	WebOffice WebEx
Workflow	Streamline routine processes in a few quick steps — no programming required. Check task status at a glance or use e-mail notifications to alert you automatically to important events. Quickly create electronic forms for engineering change orders, expense reports, etc. Graphical "trees" make it easy to chart complex processes. Built-in workflow templates help automate contact management, Help Desk, resume tracking and more, right out of the box.	Forum ZX Sitescape
Workflow	GroveSite's Issue Tracking solution makes it simple for a manager to add new issues, assign responsibility, track progress and share resolution. Each issue can have multiple files associated with it so that relevant information is all kept in one location.	GroveSite 4.0 GroveSite
Workflow	AR: Invoicing. Order Workflow from Quotation to Invoiced Sales	24SevenOffice 24SevenOffice
Workflow	AP: Web Access to AP related data and forms, scan vouchers as images.	24SevenOffice 24SevenOffice
Workflow	WorkFlow Engine: ported from Galaxia/Tikiwiki and heavily modified avaible in egroupware 1.2. Also, includes Resources: Resources managment (inventory) and booking tool integrated into eGW calendar.	eGroupWare eGroupWare
Workflow	Can add multiple workflow rules to Smart Space.	Alfresco Alfresco Software, Inc.
Workflow	Specific Instance of a help desk or trouble ticket	PHProjekt PHProjekt
Workflow	Workflows for maintaining Inventories, Resources, Brands, Locations, Distributors, Device types, Offices, Positions, Companies, Departments	Simple Groupware Simple Groupware Solutions
Workflow	Provides a web interaface for performing transactions.	Nuxeo Collaborative Portal Nuxeo
Workflow	Customizable control over editorial content.	Bricolage Bricolage

Feature	Description	Software Company
Workflow	Allows development of Forms with customizable Rules to enable collaborative processes to reflect specific	Groove Virtual Office Groove Networks
Workflow	Manage Tasks, simple workflows, spent work time and personal memos.	GroupVille Sendai Systems
Workflow		Lotus Notes IBM
Workflow	Includes open source activity-based Workflow engine.	Tiki CMS/Groupware Tikiwiki
Workflow	Application: An APPLICATION is a sequence of pages containing elements and rules. The user is taken through a series of pages. The rules perform logical and numerical calculations are the user submits the pages. APPLICATION makes it easy to define complex logical conditions for the rules, and the many different kinds of ›actions make it possible to implement just about anything.	Generic Applications Server Things Prime
Workflow (Bug Tracking)	The Web Horde User Problem Solver, besides being a contrived acronym, is a ticket-tracking system integrated with the rest of Horde. It runs	Horde Framework Horde Project
Workspace	Provides a web interface for managing permissions and content for projects. Manage your account and personal information, create blogs and other applications, connect to friends.	ODS/Virtuoso OpenLink Software
Workspace	Smart Spaces organize content and other spaces. Defines rules for how content is managed in that sapce. (Ex. Workflow, checkout, versioning rules)	Alfresco Alfresco Software, Inc.
Workspace	Wokspace for managing permissions and content for projects.	Nuxeo Collaborative Portal Nuxeo
Workspace	Add, edit, delete, content through web interface.	Bricolage Bricolage
Workspace	Google Docs & Spreadsheets is a web-based word processing and spreadsheet program that keeps documents current and lets the people you choose update files from their own computers. Just enter the email addresses of the people with whom you want to share a given file and send them an invitation.	Writely (Beta) Google

Feature	Description	Software Company
Workspace	List of projects with tree structure. Subprojects with unlimited depth.	PHProjekt PHProjekt
Workspace	Project Manager: Element based Projectmanager higly integrated with all other eGW apps. Also includes a Wiki for content as well.	eGroupWare eGroupWare
Workspace	Link projects to customer or employee contacts and or link tasks to projects. Store email, Office documents such as faxes in the document archive which can be associated with any project. Finally, link any OGo application with your project. A true project centric environment.	OpenGroupware SKYRIX Software AG
Workspace	Project Workspace. Organize project content and nested projects. Resources: Calendars, Forums, Action Items, and Image Gallery.	Epiware Epiware
Workspace	Modules can be assigned to every folder in the tree structure. For example, you can have as many calendars as you like. Individual rights (read, write, admin) can be assigned to users and/or groups for every folder. Every user can create his own folder structure. By assigning individual rights you can share any information among all user groups.	Simple Groupware Simple Groupware Solutions
Workspace	Wokspace for managing permissions and content for projects.	phpGroupWare, Free Software Foundation
Workspace	Project related content located in a single, consolidated workspace. One place to do project-related activities without going back and forth between multiple tools and channels. Ability to store multiple file formats.	Collanos Workplace Collanos Software
Workspace	Lists info, people, deadlines assoc. with project.	BaseCamp 37signals
Workspace	Shared Workspaces. Users can rate, read, edit, add, move and delete objects, or groups of objects, in this shared folder.	Basic Support for Cooperative Fraunhofer Society
Workspace	Objects can be personal or public. Objects include: Document under version control, Folder, URL, Discussion, Note, Search folder, Calendar, Contact list, Email message, Project, Flow folder, Task, Document set	Basic Support Cooperative Fraunhofer Society
Workspace	Project Workspace. Organize project content and nested projects. (version control, issue tracking, etc.)	CollabNet CollabNet

Feature	Description	Software Company
Workspace	Meeting is not for scheduling meetings, but for managing all documents related to a meeting via a single URL (rather than having all participants having to manage everything related to the meeting via their already busy inboxes).	Generic Applications Server Things Prime
Workspace	Site Directory – SharePoint Portal Server 2003 includes a Site Directory that you can use to aggregate, organize, find, and manage Web sites, including Windows SharePoint Services sites. From the Site Directory, you can easily create a new SharePoint site or add an existing internal or external site to the directory. To make these tasks easier, you can use metadata (for example, "date created" or "geographical region") to filter and sort the directory.	Sharepoint Microsoft
Workspace	Workspaces – With Windows SharePoint Services, you can create Document Workspace and Meeting Workspace sites, which provide to users collaboration tools and services for either collaboration on documents or for resources relevant to meetings. Workspaces can contain lists of information such as related documents, team members, and links. Document Workspace and Meeting Workspace sites can be created either via the browser, or automatically from within Microsoft Office Outlook® 2003 by sending an attachment or sending a meeting request.	Sharepoint Microsoft
Workspace	Because renaming files and moving them between directories is somewhat inconvenient, the first thing you do when you start a new project should be to think through your file organization. It is not impossible to rename or move files, but it does increase the potential for confusion and CVS does have some quirks particularly in the area of renaming directories. In the course of a project, one will often add new files. Likewise with removing or renaming, or with directories. The general concept to keep in mind in all these cases is that instead of making an irreversible change you want CVS to record the fact that a change has taken place, just as with modifying an existing file.	CVS Ximbiot
Workspace	GroveSite's online tools for project management make it easy for a manager to assign tasks, streamline communications, keep track of critical dates, attach files, and report on project status.	GroveSite 4.0 GroveSite

Feature	Description	Software Company
Workspace	Visual SourceSafe 6.0c is the easiest, most productive source code management and version control system for development teams using Microsoft Visual Studio® .NET. Developers can safely and easily manage source code, Web content, and any other type of file—all from the comfort and convenience of Visual Studio .NET. Branch files and projects into separate copies—for example, one copy for a team working on beta version bug fixes and a separate copy for the team working on the release version.	Visual Source Safe Microsoft
Workspace	WebAsyst Project Manager™ is a web based software tool which manages customers, projects and task lists online. Multiple projects for every customer, defining the scope of work for each project and assigning personnel. Stores project information in a centralized and secure place online. Outlines scope of tasks, manage assignments and project costs. Ability to View and track project progress using Gantt Chart diagrams. View multiple project statistics reports on one page. Collaboratively access project information; completely control individual or group access, assign full or partial rights.	WebAsyst WebAsyst
Workspace	A centralized place for all of your personal information as it relates to your Workspot account. In this page you can change your password, update your contact and/or billing information.	WorkSpot WorkSpot
Workspace	Start with a blank slate, and in a matter of minutes you can create the precise folder structure you need. All the folders have names that make sense to you and your client. Create as many folders and subfolders as you like. Or if you use a similar folder structure across projects or clients, you can reuse the folder structure from an existing project or template.	WorkZone Trichys
Workspace	Rally Point is a community collaboration site designed for homeowners associations (HOAs), apartment complexes, condominiums or any other group of people who need to share files, notes, FAQS, log information, financials or car registration information.	RallyPoint WBPSystems
Workspace	The project environment is a 3D virtual environment, users can interact with documents, people, and resources related to the project or meeting in real time.	Worskpace3D Tixeo Soft
Workspace	Create & delete mailboxes, distribution lists & groups, configure shared folders, assign global spam settings, block lists, etc.	WebOffice WebEx

Feature	Description	Software Company
Workspace (Virtual Environment)	Participants will meet in a 3D environment. Each being shown as a 3D character and seeing through this character's eyes. It is controlled using the mouse allowing to move in the environment. Each participant sees others move and act on applications.	Worskpace3D Tixeo Soft
Workspace (Virtual Environment)	Manage and Manipulate objects in a virtual setting.	Croquet Viewpoints Research Inst.
Workspaces	Organize information hierarchically by division, department, project, etc. via individually configured workspace.	Forum ZX Sitescape